TECHNOLOGY DEPT:

The INSTITUTION *of* PRODUCTION ENGINEERS

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JOURNAL

(*November* 1943, *Vol. XXII, No.* 11, *Ed. B*)

CONTENTS

REPORT OF ANNUAL GENERAL MEETING

INAUGURAL MEETING OF THE LINCOLN SUB-SECTION

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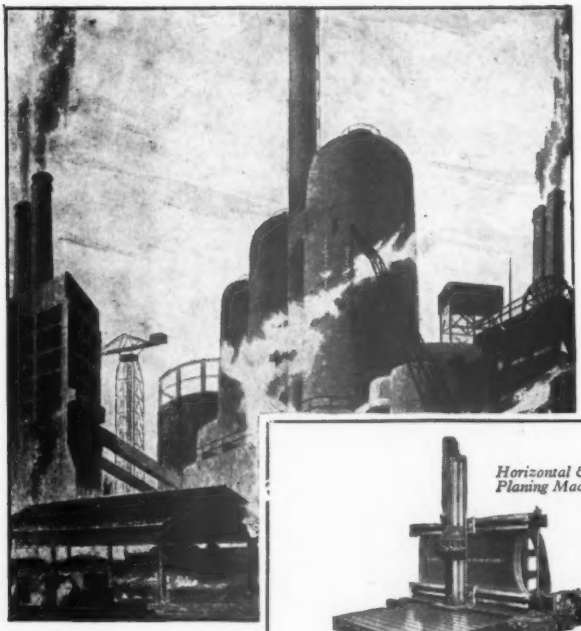

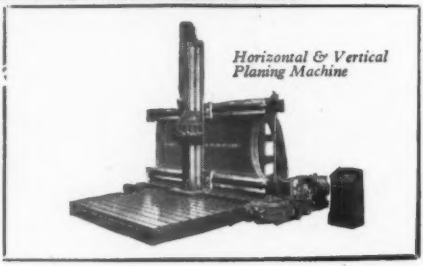

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OUR PRESENT AIM is maximum production to strengthen the sinews of war.

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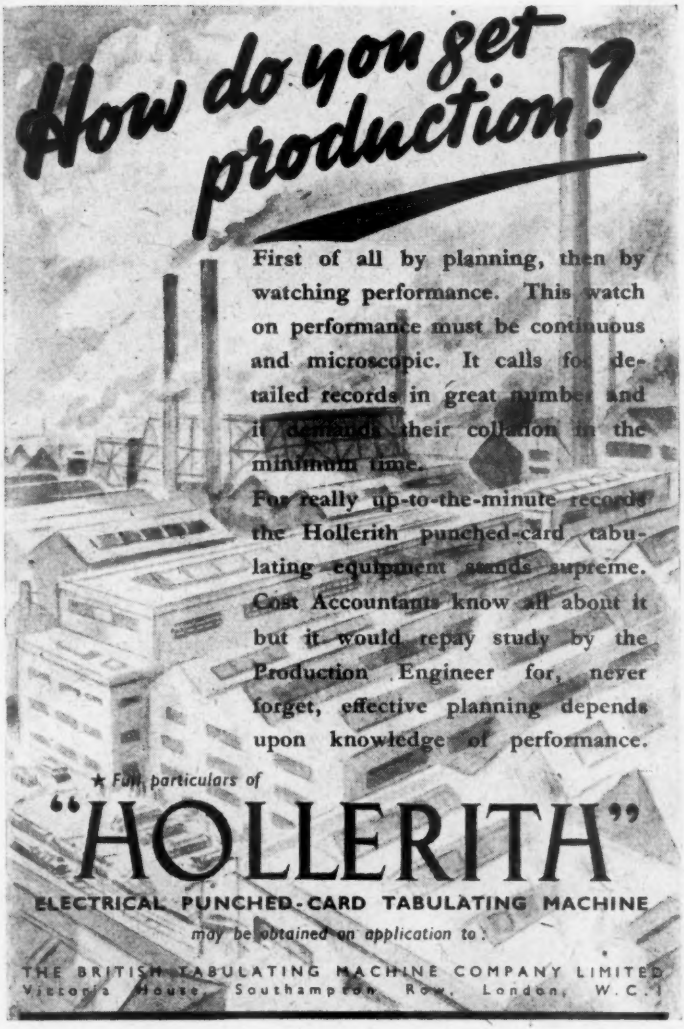
How do you get production?
First of all by planning, then by watching performance. This watch on performance must be continuous and microscopic. It calls for detailed records in great number and it demands their collation in the minimum time.
For really up-to-the-minute records the Hollerith punched-card tabulating equipment stands supreme. Cost Accountants know all about it but it would repay study by the Production Engineer for, never forget, effective planning depends upon knowledge of performance.
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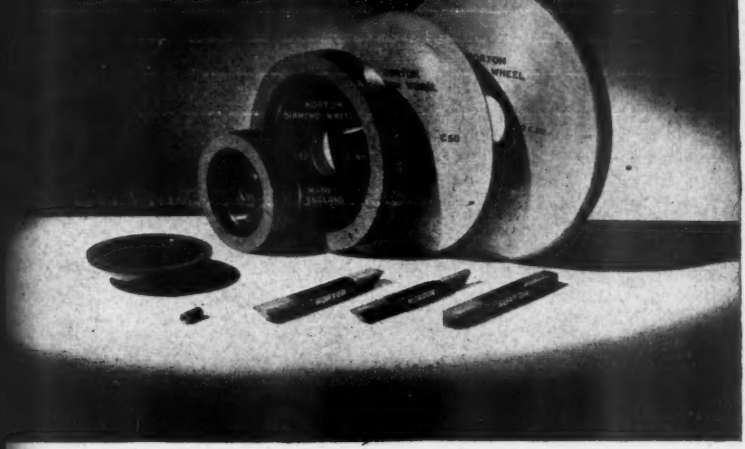

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FOR MAXIMUM PRODUCTION REQUIRES CLOSER ATTENTION TO THE CAREFUL MAINTENANCE OF ALL TIPPED TOOLS.

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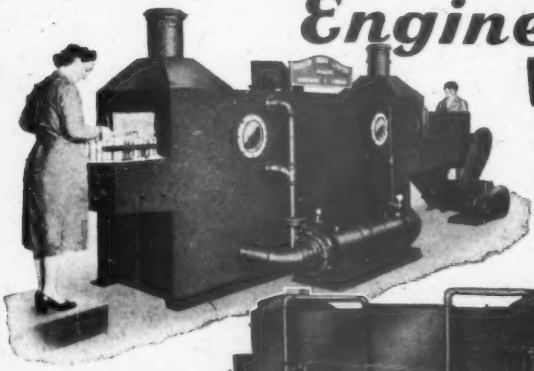
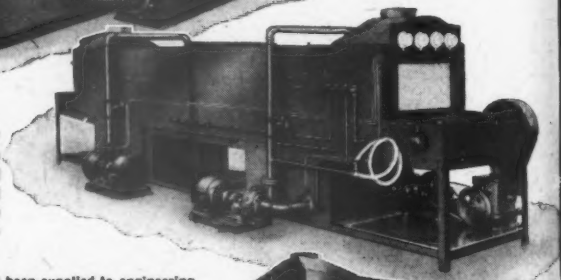


THESE MACHINES ARE INCREASING PRODUCTION AND REDUCING CLEANING COSTS



Dawson Industrial Hydros for the cleaning of Metal Parts are to be found in the biggest engineering works in Great Britain, and, of course, in many of the smaller establishments.

Many of these machines have been supplied to engineering firms and armament factories for cleaning aircraft parts, shells, bombs, rifles, gun parts, cartridge cases, metal Pressings, fuses machined and precision parts.

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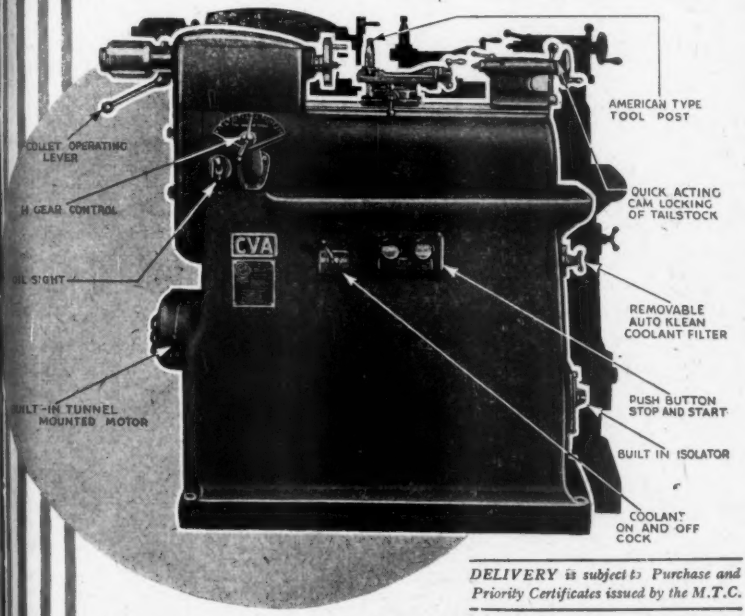
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This machine is specially designed for the manufacture of small parts requiring the highest degree of accuracy. ● Every individual part is manufactured to precision limits and jigged to ensure interchangeability. ● All sub-assemblies and the complete machine are subjected to very rigid inspection tests before leaving the works.

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Height of centres	**$3^{1}/_{2}$in.**
Max. distance between centres	**12in.**
Spindle speed	**250-2000 r.p.m.**
(infinitely variable)	

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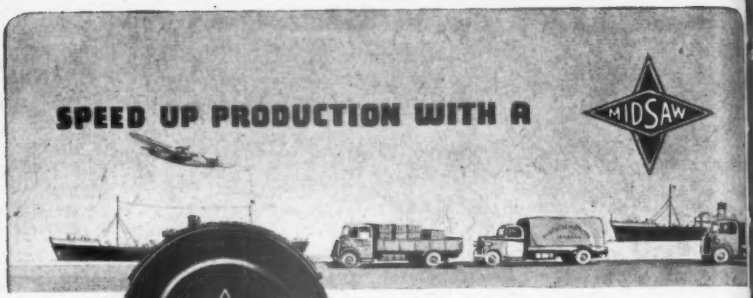

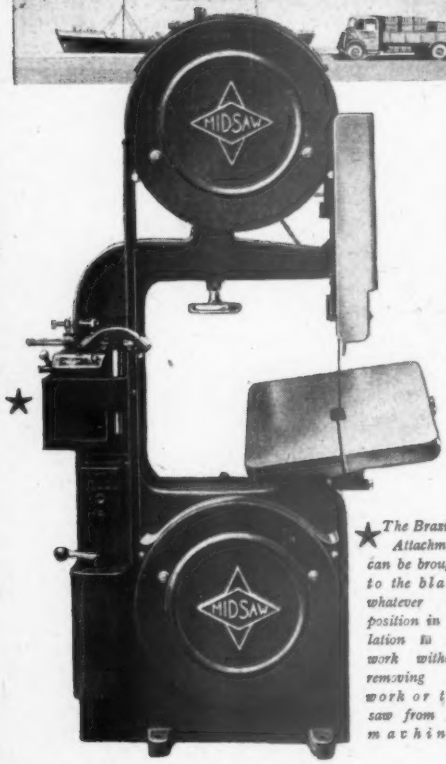

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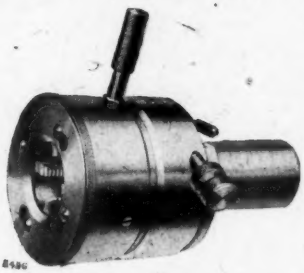

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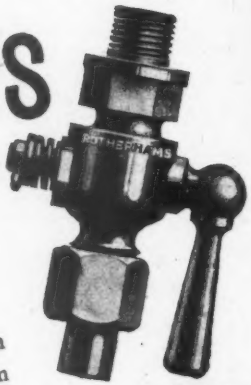

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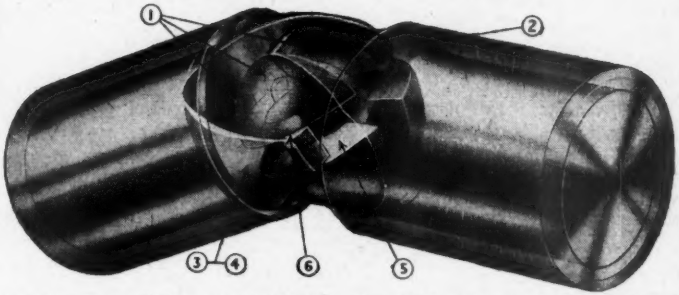

1 Only three working parts.

2 Forks solid with joint halves.

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4 Fork elements of ideal form for cantilever loads.

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6 Torque transmitting members disposed at maximum distance from axis, thus reducing loads.

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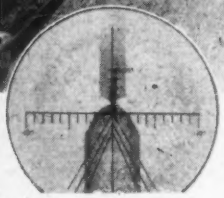
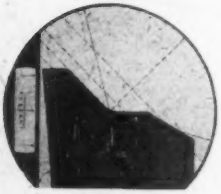
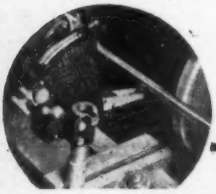


Profile Grinder incorporating Microscope controlling shape of grinding wheel.



Toolmakers' Micrascope. View through Protractor Graticule measuring angle of tool



Mechanical Indicating Gauge. Gauging whilst grinding on machine.

BEGIN at the BEGINNING

Precision in the finished product will ultimately be secured only if the same standard of accuracy is observed in the preceding stages.

Planned-Precision gets right back to fundamentals and starts by ensuring the correct shape of the grinding wheel for forming the tool which is to cut the work. Thus from start to finish every operation is carefully observed and checked and precision assured.

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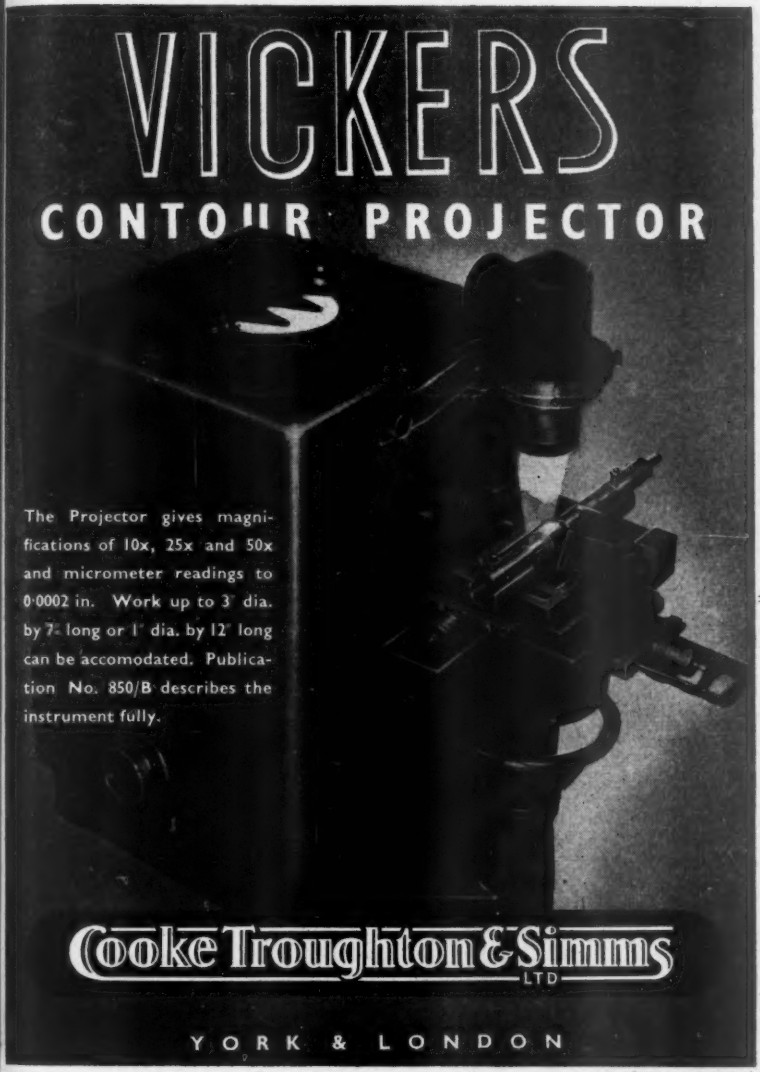
VICKERS

CONTOUR PROJECTOR



The Projector gives magnifications of 10x, 25x and 50x and micrometer readings to 0·0002 in. Work up to 3" dia. by 7" long or 1" dia. by 12" long can be accomodated. Publication No. 850/B describes the instrument fully.

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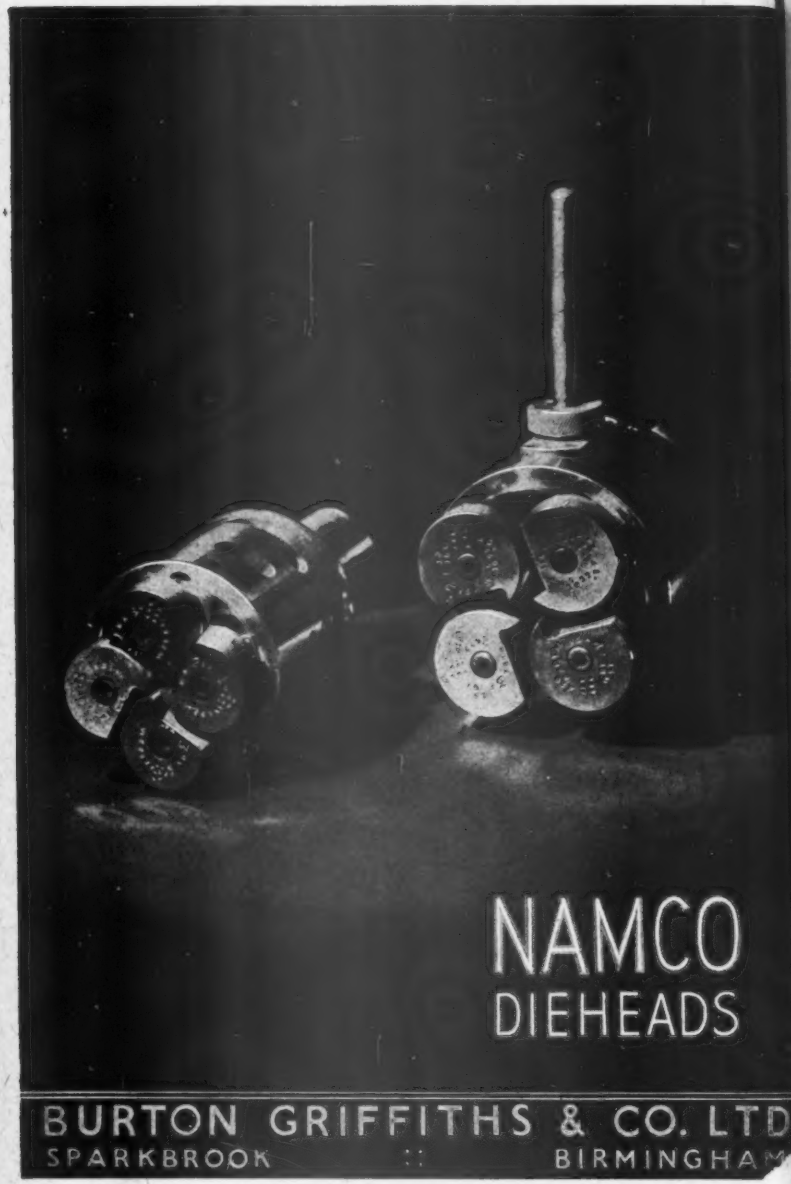
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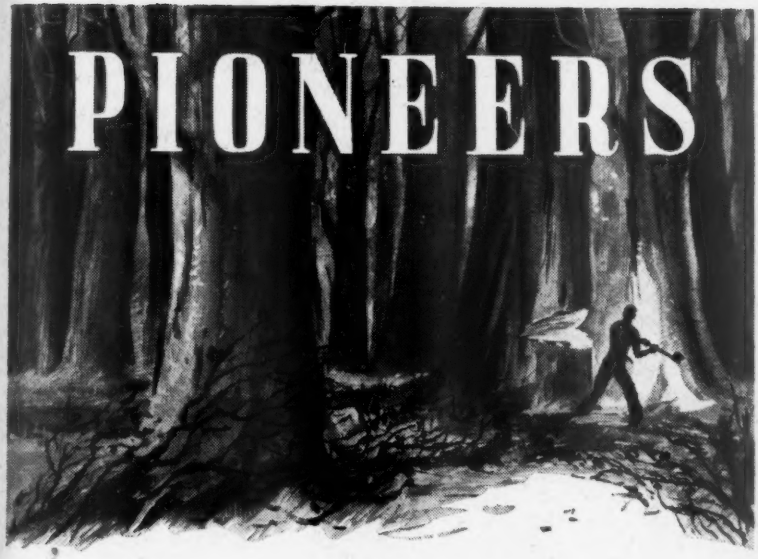

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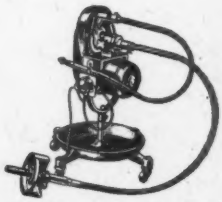

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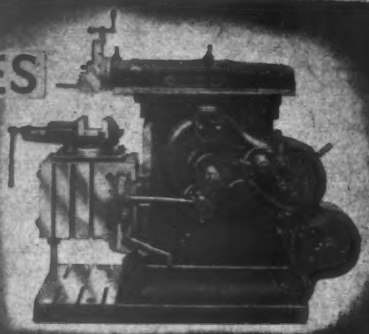

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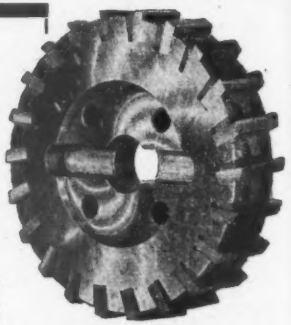
MILLING CUTTER BLADES
for faster milling and more work per grind . . .



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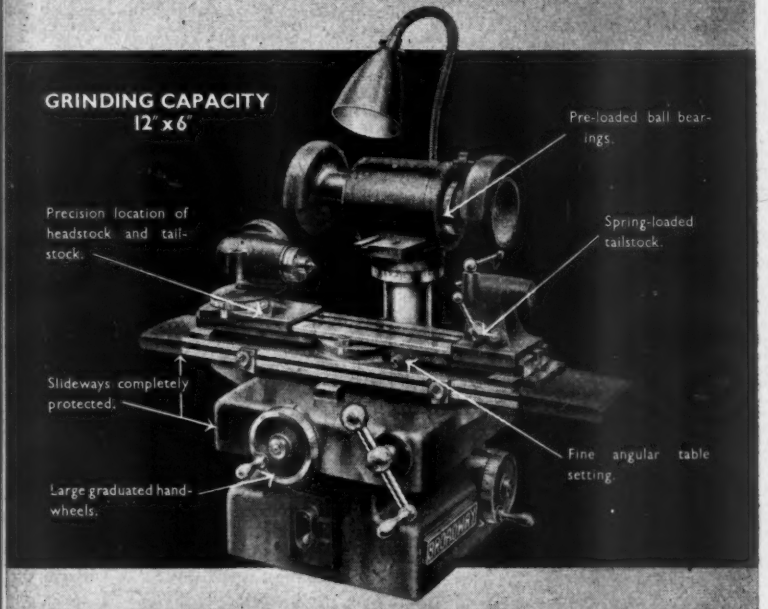

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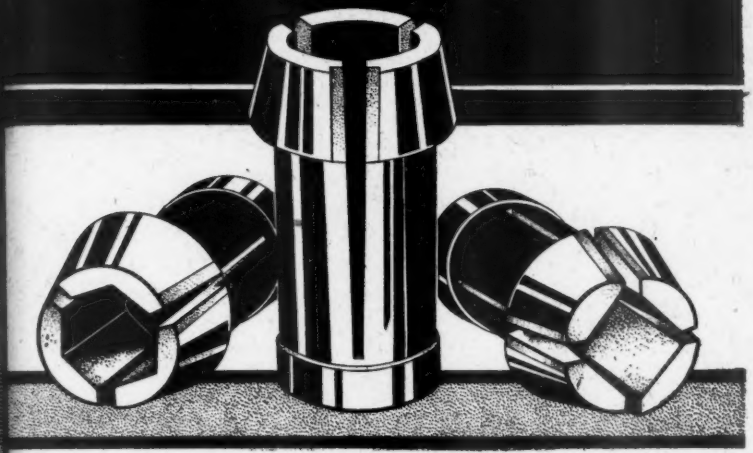

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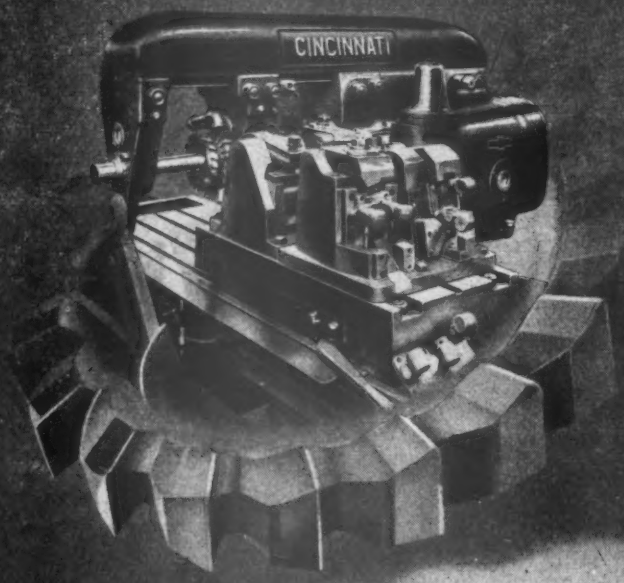

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INDEX TO ADVERTISEMENTS

As a war-time measure the advertisement section of this Journal is now published in two editions, A *and* B. *Advertisers' announcements only appear in one edition each month, advertisements in edition* A *alternating with those in edition* B *the following month. This Index gives the page number and edition in which the advertisements appear for the current month.*

	Page
Arnott & Harrison, Ltd.	vi A
Automatic Coil Winder Co. Ltd.	xviiA
Barber & Colman, Ltd.	x B
Baty & Co., J. E.	xviii A
Block & Anderson, Ltd.	xxiii B
Bratby & Hinchliffe, Ltd.	xxvii A
British Aero Components, Ltd.	xix B
British Tabulating Machine Co. Ltd., The	iii B
Broadway Engineering Co. Ltd.	xxvii B
Brown, David. & Sons, (Hudd.) Ltd.	xiii A
Burton, Griffiths & Co. Ltd.	ii A xviii B
Carborundum, Ltd.	xvi A
Catmur Machine Tool Corporation, Ltd.	xv B
Cincinnati Milling Machines Ltd.	xxx B
Climax Rock Drill and Engineering Works, Ltd.	xxv B
Cooke, Troughton & Simms, Ltd.	xvii B
Craven Bros. (Manchester) Ltd.	viii A
Dawson Bros. Ltd.	vi B
Deloro Smelting & Refining Co. Ltd.	xxii B
Desoutter Bros. Ltd.	vii A
Drummond (Sales) Ltd.	xx B
Firth, Thos. & John Brown, Ltd.	xvi B
Fletcher Miller, Ltd.	xxvi B
Furzehill Laboratories Ltd.	xi A
Gilman, F., (B.S.T.) Ltd.	xxi B
Guylee, Frank, & Son, Ltd.	xxxi A
Herbert, Alfred, Ltd.	xxv A xi B
Higgs Motors, Ltd.	x A
High Duty Alloys, Ltd.	xix A
Holman Bros. Ltd.	xxxii A
I.C.I. (Paints), Ltd.	xxiv B
Leabank Chairs Ltd.	xxvi A
Leytonstone Jig and Tool Co. Ltd.	xii A
Lumigage	xviii A
Lund, John. Ltd.	ix B
Macrome, Ltd.	xxii A
Marshall, Sons & Co.	xxix A
Midgley & Sutcliffe	xx A
Midland Saw and Tool Co. Ltd., The	viii B
Mollart Engineering Co. Ltd.	xiii B
Motor Gear Engineering Co. Ltd.	xxii A
M.P.J. Gauge and Tool Co. Ltd.	xxiv A
National Alloys, Ltd.	iii A
Newall, A. P., Ltd.	xv A
Newall Engineering Co. Ltd.	xxx A
Norton Grinding Wheel Co. Ltd.	v B
Parkinson, J., & Son	v A
Piftin Ltd.	xxvi A
Precision Tool & Instrument Co. Ltd., The	xiv A
Pryor, Edward, & Son, Ltd.	xxiv A
Rotherham & Sons, Ltd.	xii B
Sanderson Bros. & Newbould Ltd.	xviii A
Sigma Instrument Co., Ltd.	xxviii A
Snow & Co. Ltd.	xxi A
Stedall Machine Tool Co. Ltd.	xxxi B
Taylor, Charles, Ltd.	xxix B
Taylor, Taylor & Hobson, Ltd.	xiv B
Urquhart, Lindsay & Robertson (Orchar), Ltd.	ii B
Vaughan, Edgar & Co.	xxviii B
Ward, H. W., & Co. Ltd.	iv A
Ward, Thos. W., Ltd.	xxii B
Wickman, A. C., Ltd.	ix A vii B
Wolverhampton Die Casting Co.	ivB
Woodhouse & Mitchell Ltd.	xxxii B

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The Council of the Institution

1943-44

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INSTITUTION NOTES

November 1943

Meetings.

5th November—Coventry Section. A Lecture will be given at The Coventry Technical College (Room A5) at 6-45 p.m. on " Powder Metallurgy," by W. D. Jones, M.Eng., Ph.D.

17th November—Birmingham Section. A Meeting will be held at The James Watt Memorial Institute, Birmingham at 7-0 p.m., when The Ministry of Supply Film " Resistance Welding " will be shown.

19th November, 1943—North Eastern Section. A Lecture will be given at The County Hotel, Newcastle-on-Tyne, at 6-15 p.m. on " Surface Finish and its Application to Practical Problems " by Dr. G. Schlesinger.

20th November—Preston Section. A Lecture will be given at The Canteen of Messrs. Clayton, Goodfellow & Co., Ltd., Atlas Works, Blackburn at 2-30 p.m. on " Metallic Arc Welding from the Production Engineers View-Point " by W. J. Vernon, Esq., M.I.W. This will be followed by a coloured film entitled " Inside of Arc Welding."

20th November—Nottingham Section. A Lecture will be held at The Victoria Station Hotel, Nottingham at 3-0 p.m. on " Cemented Carbide Cutting Tools " by Mr. Pinder of Wm. Jessop & Sons, Ltd., Sheffield.

24th November—Leicester and District Section. A Lecture will be held at The College of Technology, The Newarke, Leicester at 7-0 p.m. on " Hydraulics Applied to Engineering Problems " by H. C. Town, Esq., M.I.P.E., M.I.Mech.E.

26th November—London Graduate Section. A Lecture will be held at 36, Portman Square, London, W.1. at 7-0 p.m. on "Arc Welding as Applied to Jigs and Fixtures " by Mr. Spragg.

28th November—Luton and District Section. A Lecture will be held at The Luton Library, Meeting Room, George Street, Luton at 10-0 a.m., on " Plastics " by Mr. Richardson (I.C.I. Ltd.).

3rd December—Coventry Section. A Lecture will be held at The Coventry Technical College (Room A5) at 6-45 p.m. on " Protective Finishes " by Jones and Walker.

3rd December—Lincoln Sub-Section. A Lecture will be held in the Technical College Lecture Hall, Lincoln, at 6-30 p.m. on " Training of Machine Tool Operators," by F. J. Keeble, Esq.

4th December—Yorkshire Graduate Section. A Works visit to Messrs. A. V. Roe & Co., 2-30 p.m.

6th December—Sheffield Section. A Lecture will be held at

The Royal Victoria Station Hotel, Sheffield at 6-30 p.m. on " The Production Technique of Industrial Plastic Mouldings " by T. H. Richardson, Esq. (I.C.I. Plastics Ltd.).

10th December—London Graduate Section. A Meeting will be held at 36, Portman Square, London, W.1., at 7-0 p.m. when a " Questions and Answers " Evening will be held.

11th December—Yorkshire Graduate Section. A joint meeting with the Graduate Sections of the Institutions of Electrical and Mechanical Engineers will be held in Room C7, at Leeds College of Technology, Cookridge Street, Leeds, 2, at 2-30 p.m., when the G.E.C. Technicolour Film " The Inside of Arc Welding," will be shown.

16th December—Leicester and District Section. A Lecture will be held at The College of Technology, The Newarke, Leicester at 7-0 p.m. on " Powder Metallurgy " by S. V. Williams, Esq., B.Sc.

17th December—Lincoln Sub-Section. A Lecture will be held in the Technical College Lecture Hall, Lincoln, at 6-30 p.m., on " Modern Machine Tool Manufacture " by T. P. N. Burness, Esq.

Committee Meetings, etc.

16th November—Meeting of the Education Committee, Queen's Hotel, Birmingham, 10-30 a.m.

16th November—Meeting of the Membership Committee, Queen's Hotel, Birmingham, 12-30 p.m.

19th November—London Committee meeting at Institution Headquarters, 12-0 o'clock.

19th November—Meeting of the Finance and General Purposes Committee, 2-15 p.m.

28th November—Meeting of the Management Committee of the Research Department, 6-0 p.m. at the Black Boy Hotel, Nottingham.

29th November—Meeting of the Management Committee at Loughborough, 10-0 a.m.

29th November—Meeting of the Finance Committee of the Research Department, 2-15 p.m., at Loughborough.

17th December—Meeting of the Finance and General Purposes Committee, Institution Headquarters, 2-15 p.m.

The Technical and Publications Committee meets at Headquarters every Wednesday at 5-30 p.m.

Council Meeting.

The next Meeting of the Council will be held on Friday, December 10th at Institution Headquarters at 11-30 a.m.

Wolverhampton Section. The inauguration of the Wolverhampton Section will take place on Tuedsay, 30th November at the Civic Hall, Wolverhampton, at 5-30 p.m.

Activities of the Coventry Graduate Section.

It was decided to revive the activities of the section (suspended due to Air Raids) at the Annual General Meeting of the Graduate Section, which immediately followed the Senior Section's Annual General Meeting, held in Coventry on 26th March.

In order to obtain the views of the members on the activities contemplated by the Committee, a Questionnaire was circulated. This also gave other useful information, such as age, address, position, etc. The return of 85% of the Questionnaires by 5th June, was considered to be extremely good. The salient features were, that the majority expressed a wish to have meetings on General Production Engineering subjects, and also for visits to Engineering Works.

The most popular type of lecture appeared to be Production Planning, closely followed by Designing for Production, Operation Planning, and Time and Motion Study. A fair number of members expressed willingness to give either short or full length papers on the various subjects suggested on the Questionnaire.

The first paper by F. P. Liebert, Esq., B.Sc.(Tech.), Grad.I.P.E., on "The Training and Prospects of the Young Production Engineer," was given on 6th September, and was followed by a discussion of high quality, including a very valuable contribution by J. Wilson, Esq., B.Sc., B.Comm., M.I.Mech.E., Principal of the Coventry Technical College.

The second meeting was the "Any Questions" evening on 11th October, when a record attendance of 170 was made. The team, who gave impromptu answers to the questions put by members, was as follows: H. D. S. Burgess, Esq., M.I.P.E. (Works Manager—A.C. Wickman, Ltd.); A. H. Lloyd, Esq., B.Sc., M.I.Mech.E. (Director of Works and Design—Alfred Herbert, Ltd.); W. G. Morgan, Esq., (Foundry Manager—Alfred Herbert, Ltd.); F. H. E. Myers, Esq., A.M.I.E.E., A.M.W.M.A. (Test Engineer—B.T.H. Co. Ltd.).

This departure from the usual type of meeting, was agreed on all sides to be a great success, and a wish was expressed for another such meeting to take place at a future date.

Two visits have so far been made through the courtesy of the directors of the respective companies, to Messrs. Sterling Metals, Ltd., on 28th June, and to Messrs. G.E.C. Ltd., on Saturday, 2nd October.

A Publication Committee has been formed from the main Committee, to supply the *Journal* with a series of Graduate Notes, News, Articles, etc.

In view of the fact that Automobile Engineering forms so large a part of the City's Industry, and the consequent close relationship between Automobile and Production Engineering, an arrangement was made with the Coventry Graduate Section of the Institution of Automobile Engineers, whereby Graduates of the I.P.E., can attend any of their meetings and vice-versa.

Research Department.

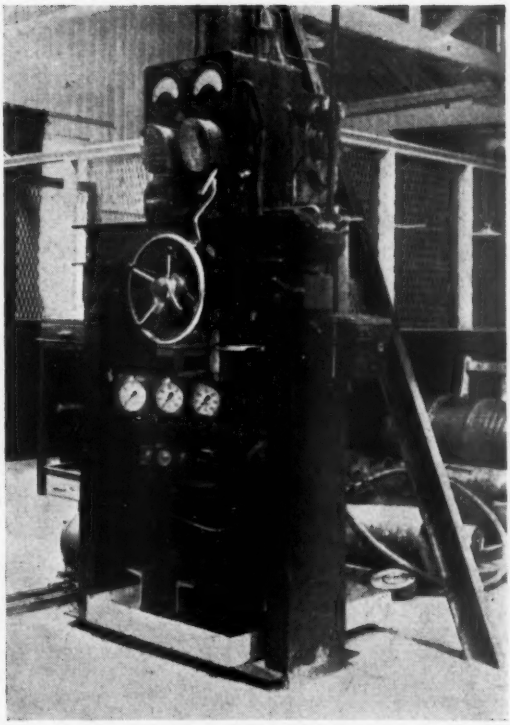
The Research Department has, during the past few months, installed a number of additional machine tools, and as few members have an opportunity of visiting the Department at Loughborough, it is felt that they would be interested in the photographs reproduced on the following pages.

The Institution Research Laboratory

Milling machine fabricated by welding

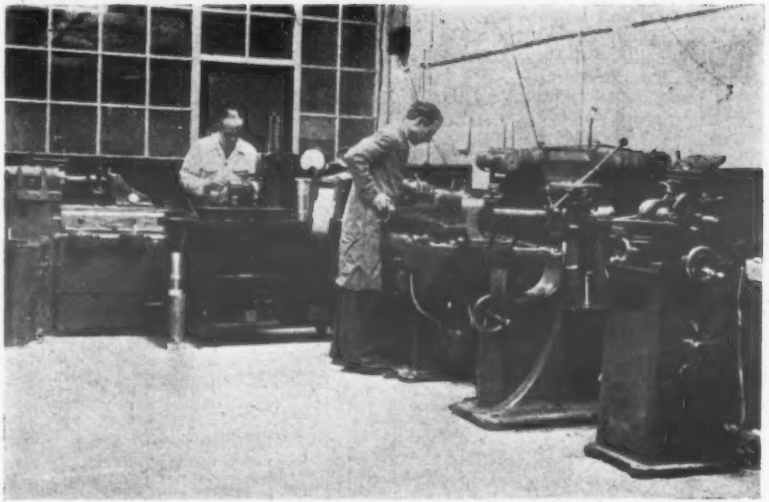
The Institution Research Laboratory

Switchboard



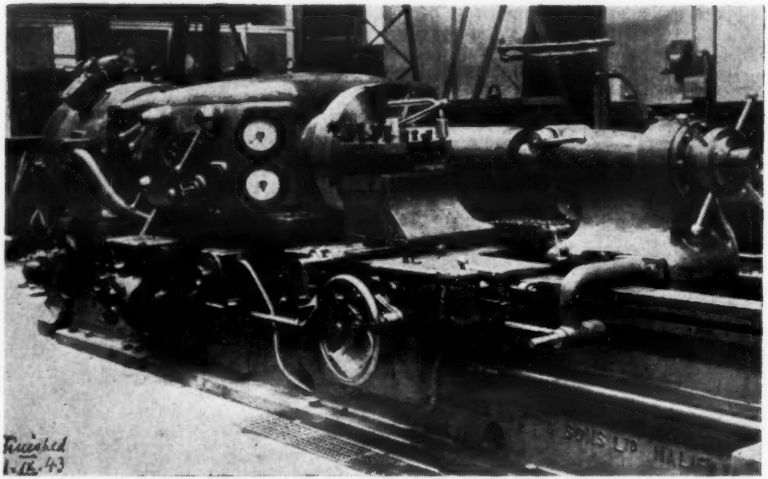
The Institution Research Laboratory

Vertical drilling machine. 15 h.p. at 1500 r.p.m.



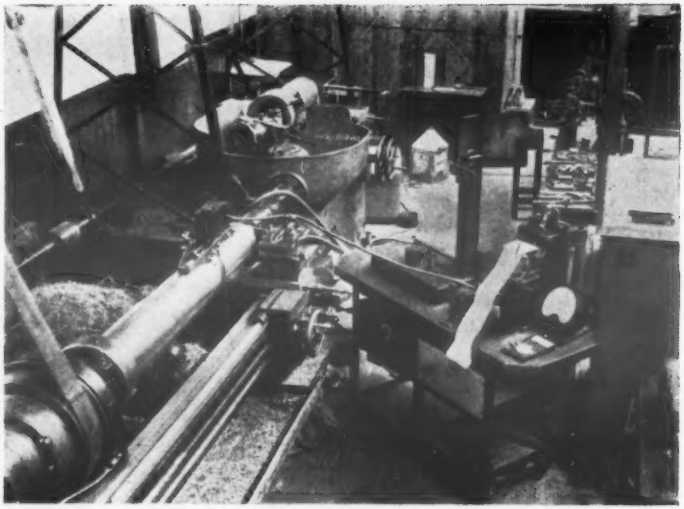
The Institution Research Laboratory

Left to right : A—Fine boring machine, electric hydraulically driven. B—" Talysurf " for checking internal and external fine turning operations. C—Diamond turning lathe up to 6,000 r.p.m. D—Universal cutter grinder. E—Twist drill grinder.



The Institution Research Laboratory

16 in. Centre Lathe with variable speeds between 17 and 1450 r.p.m. Driven by 60 h.p. motor.



The Institution Research Laboratory

Lathe for finishing tests—belt driven using the transportable pickup of the "Talysurf" surface meter. In the background the tool grinder for single point cutting tools.

ANNUAL GENERAL MEETING

of the Institution of Production Engineers held on Friday, 29th October, 1943

THE Twenty-Second Annual General Meeting of the Institution was held at the Grosvenor House, Park Lane, London, W.1., on Friday, 29th October, 1943, when some 500 members and guests were present. The chair at this meeting was occupied by Sir Ernest Lemon, O.B.E., the President.

The Late Mr. Richard Hazleton.

The President in opening the meeting asked all present to stand in memory of our late General Secretary, who did so much for the Institution. All members stood in silence for a few moments.

The General Secretary.

Continuing, the President introduced Dr. K. G. Fenelon, the new General Secretary, and asked the meeting to give him a very hearty welcome. The General Secretary, who was received with applause, then read the notice convening the meeting.

Minutes of Previous Meeting.

The Minutes of the previous Annual General Meeting were taken as read, and were confirmed and signed.

Annual Report of the Council.

The President then called upon Mr. H. A. Hartley, Chairman of Council, to present the Annual Report of the Council which included the Annual Report and Accounts of the Research Department for the year ended 30th June, 1943.

MR. H. A. HARTLEY : In presenting the Annual Report of the Council which includes the Annual Report of the Research Department, I should first like to refer to what the President has already mentioned, namely the great loss which the Institution suffered by the death of Mr. Richard Hazleton. This Institution owes a great deal to the wonderful personality and untiring energy and devotion of Mr. Hazleton, and it was a very heavy blow to us all when we heard in January of this year that he had passed away. For some time we wondered whether we should ever find another Secretary, in view of the difficulties of the war situa-

tion; but we were fortunate enough to secure the services of Dr. Fenelon, and I am sure that in due course all the members of the Institution will ratify the choice which has been made.

I also want to refer to the splendid service rendered by Mr. Gibbons, our Assistant Secretary, during the interim. (Applause). He carried on the work in a really remarkable way in very difficult circumstances, and he has earned our gratitude for every step of the way he went. (Applause).

I should also like to mention our Research Department, which has grown and flourished during the past year, doing a great deal of very important work for the Government and for private firms in the interests of production. We look forward to the day when full recognition will be given to it by the Department of Scientific and Industrial Research, and we hope that that day will not be far distant.

We are looking forward with great pleasure to hearing Sir Stafford Cripps in due course. It is at his own request that he is invited to speak to us this afternoon, as he expressed a wish to address the Institution. Normally we should ask our President to give the address, but Sir Ernest Lemon is kindly standing down so that we may have the pleasure of hearing Sir Stafford Cripps. I have much pleasure in proposing the adoption of the report and accounts.

MR. W. F. DORMER seconded the motion, which was carried unanimously.

Election of Auditors for 1943/44.

MR. H. W. BOWEN: I beg to move that Messrs. Gibson, Appleby & Co., Chartered Accountants, be re-elected auditors to the Institution for the year, 1943/44.

MR. T. R. KIDD seconded the motion, which was carried unanimoulsy.

Election of President and Members of Council.

THE GENERAL SECRETARY read the results of the election of the Members of Council for the year 1943—1944 which were as follows: President, Sir Ernest Lemon; Deputy President, Lord Sempill; Past Presidents, G. E. Bailey, Sir Alfred Herbert, Viscount Nuffield, J. D. Scaife; Chairman, H. A. Hartley; Past Vice-Presidents, J. H. Bingham, J. E. Blackshaw, J. T. Kenworthy, R. Kirchner.

Vice-Presidents (Section Presidents): *Coventry*, W. J. Anstey; *Birmingham*, L. J. Munn; *London*, W. H. Bowen; *Luton*, J. R. Pearson; *Manchester*, J. W. Davies; *Glasgow*, I. Garvie; *Eastern Counties*, D. Ransome; *Yorkshire*, C. W. Mustill; *Sheffield*, S. R. Howes; *Western*, H. B. Dauncey; *Southern*, F. Blackith; *Leicester*, M. H. Taylor; *Preston*, L. C. Row; *Edinburgh*, J. L. Bennet;

Sydney, J. Finlay ; *Cornwall*, C. D. Alder ; *Nottingham*, C. J. Hyde-Trutch ; *North Eastern*, W. Scott ; *Northern Ireland*, W. P. Kemp ; *South Wales and Monmouthshire*, A. Bailey, *Melbourne*, B. S. Round.

Additional Section Representatives : F. W. Halliwell (London), G. H. Hales (London), J. E. Baty (London), E. P. Edwards (Birmingham), J. W. Berry (Birmingham), S. Smith (Manchester).

Ordinary Members : R. M. Buckle, H. D. S. Burgess, F. W. Cranmer, J. S. Daniels, W. F. Dormer, H. A. Drane, T. Fraser, J. France, H. J. Gibbons, E. W. Hancock, J. A. Hannay, R. R. Hutchings, E. J. H. Jones, W. C. Puckey, F. A. Pucknell, H. Schofield, T. Thornycroft, F. C. White, F. Williams, J. G. Young.

THE PRESIDENT : Mr. George Bailey, your late President, has, like myself, not been in very good health during the past year. Is it your wish that a letter should be sent to him, expressing our regret that he is not able to be present and our good wishes for his speedy restoration to health ?

This was unanimously agreed.

The President-Elect.

THE PRESIDENT: The Council have invited Sir Robert McLean to be President of the Institution for next year. He is here on the platform, so that you can all give him a hearty welcome. I can, without hesitation, recommend him to you, and I am sure that Lord Sempill can do the same ; in fact, anyone who knows what he has done not only in aircraft production but in other fields of industry will say that we are very fortunate to have Sir Robert McLean as President-Elect. (Applause.)

Introductory Remarks by the President.

THE PRESIDENT : You are now, according to the agenda, to hear a speech by me, but I do not propose to do so as we have a Minister of the Crown coming here. Sir Stafford Cripps is a very outstanding personality in politics in this country and I do not know that you will want to hear an address from me. Another year, however, I suggest that your President should address you on the functions of the Institution, and I suggest that you should follow the example of the Institutions of Civil and Mechanical Engineers and lay down a policy.

You are the men who manufacture the products on the floor of the workshop. There may be all kinds of financial adjustments, accounting adjustments and so on, but everything depends on whether you can produce cheaper than the other fellow. That is going to be enormously important after this war.

The Minister who has been kind enough to come here to address you has now arrived, and I shall not take up your time further ;

but I think that Sir Robert McLean next year may want to claim Sir Stafford's right of addressing you.

SIR STAFFORD CRIPPS, M.P. (Minister of Aircraft Production), then addressed the Meeting on "The Human Element in Production."

Vote of Thanks to the Minister.

THE PRESIDENT: I am going to call on Sir Robert McLean to propose a vote of thanks to Sir Stafford Cripps for coming here this afternoon and addressing us. I know what you are all feeling, and what I feel—that this ought to have been a closed meeting, so that we could have questioned him on some of the things he has said but as he is a Minister of the Crown, carrying one of the biggest responsibilities in the Production Ministries in this war, I do not think that we can do that to-day.

SIR ROBERT MCLEAN: It is my privilege to propose a vote of thanks to Sir Stafford Cripps for his very stimulating and in some ways provocative speech. None of us could possibly have had all these issues and problems out of our minds in the last five years. They do not become easier as they grow older. Personally, I have had a happy experience—a large number of people, many thousands, who have responded in the most willing way to this co-operation between management and workmen, so that we feel and believe that we are a "happy ship." I agree entirely with Sir Stafford that if you can take your workpeople in some degree into your confidence you will be on so much the better terms. Last Christmas I invited my Joint Production Committee to dine with me. They had gone through the whole of our system and been taught what is involved in production planning, and after dinner the leader of the workmen's side got up and said that they thanked God that it was we and not they who had to deal with these Government departments!

I myself feel that we are witnessing the recoil of the spring of the beginnings of the industrial age. We brought these vast numbers of people together in industrial centres. No one can claim that it is possible to make a workshop into a pleasant place to live and work in; no one can say that a man can find all his amusements in that workshop. We have come to the stage now when these aggregations of people must be given an outlet. We must make them places where they can find their social outlets and where they can organise their leisure and have every chance to live a happy life.

Sir Stafford is a very busy man, and we should congratulate ourselves that he has found time from his many preoccupations to come here and address us. We wish him well in dealing with his

vast and very difficult problems, and I propose a very cordial vote of thanks to him for his address.

LORD SEMPILL: I am indeed honoured to follow the President-designate in seconding this vote of thanks to the Minister of Aircraft Production. He has had, as we well know, a very remarkable career. I suppose that few if any statesmen of any age have played a part in such important matters as those which it has fallen to his lot to direct. He was, as you know, our ambassador in Moscow in fateful times, and when the Russo-German pact was broken by Germany (adopting her usual practice of breaking a pact when she thought that it was to her advantage so to do) he was the first man at the side of Marshall Stalin, the ally of to-day, with the hand of friendship and with ships loaded with such supplies as we were able to send. Then, when he came back from that important mission he carried messages from His Majesty's subjects in Great Britain to his subjects in India, about the details of which we shall no doubt learn a great deal more from the enactments which the new Viceroy will be seeing to in the term of office which has just opened.

We are, however, particularly interested in Sir Stafford's visit to us because among His Majesty's Ministers he is a unique specimen, in that he has had a scientific training. Very few of His Majesty's Ministers, as you know, have had a scientific training. He therefore approaches these problems of production engineering and other phases of science and engineering with experience born of his previous training.

He has delivered a most interesting address to us, and one which, though it may not be hotly debated in his presence, will certainly be hotly debated amongst us in his absence. Let me remind you that of the many publications of which he has been the author, perhaps that which gives him most pride is the joint paper which in his early years he published under the aegis of the Royal Society; for no greater honour could fall to any man trained in the sciences or in engineering than to have a paper published by the Royal Society. In all the questions affecting our daily life, the impingement of science and engineering is all-important; and therefore the fact that one of His Majesty's Ministers has had a scientific training and has been good enough to come here and pay us the compliment of giving us this interesting address evokes our gratitude and thanks, and I warmly join with Sir Robert McLean in thanking him very much indeed on behalf of all who are gathered here for his address. I am sure that many of us here will have read of his great forensic powers, but to-day we shall carry away a memory of a practical experience thereof.

The vote of thanks was carried unanimoulsy, with acclamation.

Award of Medals.

THE PRESIDENT: We cannot have medals presented in war-time, but I want to announce the names of those to whom they have been awarded, and I will ask those of the recipients who are present to come forward and shake hands with Sir Stafford Cripps.

The awards were as follows: The medal for the best paper presented by a member during last session has been awarded to Mr. R. Appleby, A.I.P.E., London Section, for his paper on "Production Control." The medal for the best paper given to the Institution by a non-member has been awarded to Dr. B. Dudding, M.B.E., for his paper on "Quality Control." The prize for the best paper presented to the Institution by a Graduate member has been awarded to Mr. J. H. Bailey, Grad.I.P.E., for his paper on "The Operation and Tooling of Single Spindle Automatics."

Sir Stafford Cripps then left the meeting.

THE PRESIDENT: If no one has anything to raise, that concludes the proceedings, and I thank you for your attendance and for giving Sir Stafford Cripps such a welcome and a careful hearing.

LORD SEMPILL: I do not know whether I shall be ruled out of order by the President, but as he has just come back from a long period of illness, due to heavy war work, I will ask you to give him a hearty cheer. We are very glad to see him here, and we hope that he will keep fit and well and be with us at all our future meetings, as I am sure he will. (Applause.)

THE PRESIDENT: Thank you. Good luck to you all!

The meeting then terminated.

LINCOLN SUB-SECTION

Report of Inaugural Meeting held at the Lincoln Technical College on Friday, 5th November, 1943

Present. Mr. H. J. Gibbons, Immediate Past President of Nottingham Section, in the Chair; Sir Ernest Lemon, O.B.E., President of the Institution; Lord Sempill, A.F.C., Deputy President of the Institution; Mr. H. A. Hartley, Chairman of Council; Dr. K. G. Fenelon, General Secretary; Mr. C. J. Hyde-Trutch, President; Mr. A. S. Johnstone, Vice-President; Mr. L. Shenton, Hon. Secretary, Nottingham Section; Mr. R. Preston, Hon. Secretary, Lincoln Sub-Section; and some 200 members and visitors.

MR. GIBBONS: Mr. President, My Lord, Gentlemen. It gives me great pleasure to be here this evening to welcome so many distinguished visitors at this gathering of the Institution of Production Engineers, and also to see so fine an audience. We are certainly very fortunate in having the President of the Institution here to-night (applause), with the Deputy President (Lord Sempill), Mr. Hartley (Chairman of the Council), Dr. Fenelon (General Secretary), and other distinguished visitors, including the President and Past President of the Lincoln Engineering Society, and the President of the Incorporated Society of Municipal Electrical Engineers.

We do appreciate so many distinguished visitors coming here to this inaugural meeting of the Lincoln Sub-Section. The meeting is really called for a dual purpose, in that, part of the time it represents a meeting of the Nottingham Section, and the Installation of Mr. Hyde-Trutch of Ruston-Bucyrus as President of the Section. The Institution and the Section are both to be congratu ated on having a man of the calibre of Mr. Hyde-Trutch to undertake the duties, and I am sure he will be a decided acquisition to the Council. It is also the Inaugural Meeting of the Lincoln Sub-Section of the Institution, and in addition to the post of Section President of Nottingham, Mr. Hyde-Trutch has been nominated as Chairman of the Sub-Section. The Sub-Section is indeeed fortunate in having Mr. Hyde-Trutch in that capacity. It is also remarkable that the Vice-President of the Nottingham Section, Mr. Johnstone, as a Lincoln man, has been nominated Vice-Chairman of the proposed Sub-Section, so for the time being the Nottingham section is controlled by Lincoln men as its officials. I might here mention that the Nottingham section secretary, Mr. Shenton is also a Lincoln

man, and I am sure that these facts will be much appreciated by all present.

It is certainly most proper that a Sub-Section of this Institution should be formed in Lincoln. It covers not only Lincoln, but Newark, Grantham and Gainsborough, Lincoln being the centre. Lincoln is of course very well known as a centre of engineering. One thinks not only of its production of internal combustion engines, but of its steam engines, of its excavators, pumping plant, to say nothing of agricultural machinery, malleable castings, drop forgings, etc. The name of Lincoln and the firms in Lincoln and district are well known all over the world, and one could devote a good deal of time to its history. Here I would like to make reference to a firm in Lincoln dealing particularly with pumps for land drainage. A very important contribution at the present time because it deals with food production, and affects every member of our population.

If I may for a few minutes I would like to say a few words about the Nottingham Section. It was inaugurated on 8th December, 1938, and I well recall that night being elected and installed as the first Section President, by our Deputy President, Lord Sempill. Lord Nuffield was President of the Institution, and he had recently given us £25,000 for Research work.

We welcome your activity in Lincoln, and we shall be pleased to assist you in whatever way possible. When the Nottingham Section was formed we had 38 members. Of course with the outbreak of war, and covering such a scattered area, we found it very difficult to arrange meetings, but we started by having our committee meetings and some of the lectures and papers in Nottingham. It was, however, very difficult to arrange transport, and so we had to leave our meetings until the summer time.

Membership of the Nottingham Section to-day stands at 150 and many applications are coming in. I think out of that 150 thirty are from Lincoln. By forming your own sub-section in Lincoln I would remind you that you are going to leave Nottingham without its principal officers.

If Mr. Hyde-Trutch is in a position to take up more work I think I can promise that the Council of the Institution will find him plenty to do, as they have done me. The Institution is a very live one, and it expects much of its officers on Council. The research work is very interesting and of very great importance. During the years that I have been Nottingham Section President, it has been very interesting to attend the annual meetings in London, to meet Mr. Leslie Burgin, Mr. Bevin, Mr. Oliver Lyttleton, and Sir Stafford Cripps.

I wish the Lincoln members every success, and with these words I will pass on to the next item on the agenda.

I formally propose the election of the following members of Committee as provisionally elected at a meeting of Lincoln and district members on 27th May, 1943, together with those since co-opted.

Mr. C. J. Hyde-Trutch, of Ruston-Bucyrus Ltd., Lincoln.
Mr. A. Johnstone, of Robey & Co. Ltd., Lincoln.
Mr. C. Stain, of Ruston & Hornsby Ltd., Lincoln.
Mr. T. McGlashan, of Ruston & Hornsby Ltd., Lincoln.
Mr. R. S. Hind, of Ruston & Hornsby Ltd., Lincoln.
Mr. A. W. Lawson, of Worthington-Simpson Ltd., Newark.
Mr. E. Burgess, of Marshall, Sons & Co., Ltd., Gainsborough.
Mr. S. R. Goodwin, of Ruston & Hornsby, Ltd., Grantham.
Mr. R. Preston, of Robey & Co., Ltd., Lincoln. (Hon. Secretary).

I also propose the election of officers, viz:

Mr. C. J. Hyde-Trutch, as Chairman.
Mr. A. S. Johnstone, as Vice-Chairman.

Mr. Hartley seconded the motion which was carried unanimously.

SIR ERNEST LEMON: Lord Sempill, Gentlemen. I do not think you could have made a wiser choice than electing Mr. Hyde-Trutch as the President of the Nottingham Section and Chairman of the Sub-Section at Lincoln, and I think you will find he will do a big job of work.

This is the first time Mr. Gibbons has worn this chain of office; and I am sorry to take it from him. He has successfully steered the Nottingham Section since its inception and has played a large part in the formation of this new Sub-Section. I will now install Mr. Hyde-Trutch, but before doing so may I ask you all to signify in the usual way your appreciation of the work of Mr. Gibbons, who has made a remarkable contribution to the Institution as Nottingham President, and as a member of the Council. (Applause).

Mr. Gibbons replied suitably, and Mr. Hyde-Trutch was officially installed.

SIR ERNEST LEMON (*continuing*): I have known Mr. Hyde-Trutch for a number of years, and for pertinacity and drive towards the objective I do not think anybody could do it better. I am quite sure that he is going to make this Lincoln Sub-Section probably a rival to the main section. I will ask Mr. Hyde-Trutch to say one or two words as the President.

MR. HYDE-TRUTCH: Sir Ernest, Mr. Gibbons, My Lord, Gentlemen. It is a very real pleasure to me to accept this position, and I very greatly appreciate the honour of being installed by our President, Sir Ernest Lemon.

Sir Ernest did not tell you that this jewel has rather more interest than that Mr. Gibbons has worn it for the first time tonight. Mr. Gibbons donated it to the Institution, (Applause), and it is a very real pleasure to me to be the first President of the Nottingham Section to take it over from its donor.

As Mr. Gibbons has told us, he has held this office during the first five years of the existence of the Nottingham Section, and a very difficult five years, mostly during the war period, where the working of the Section has been greatly handicapped by war conditions, and we are very greatly indebted to his leadership and enthusiasm that the Section has carried on at all, and so successfully. Mr. Gibbons has very ably represented us on the Council, and I am sure that is evidenced by the number of committees on which he is serving, and particularly (I am sure Mr. Hartley will vouch for it) he has done very fine work in connection with research for the Institution.

I feel therefore that in wearing this jewel that we should regard it as a symbol of the leadership and enthusiasm of our Past President, and I feel very deeply mindful of the splendid example which I shall do my best to emulate. All I can say is I will do my best.

Turning now to the Lincoln Sub-Section, and thanking you for my election as its first Chairman, I am very glad indeed to have this opportunity and privilege of guiding its first steps, and I assure you that I have the advantage of the co-operation of a very active committee, and our officers, Mr. Johnstone, Vice-Chairman, and Mr. Preston, Hon-Secretary. I assure you, you need have no fear in leaving the work of the Sub-Section in their hands, and you have before you to-night the first sample of their work, which is the programme of this session's meetings.

(Mr. Hyde-Trutch then read the Winter programme).

Gentlemen, I hope you will support us in attending these meetings, and it is up to you, the members of the Institution, of all grades, living in Lincoln, Newark, Grantham, and Gainsborough districts, to make this Sub-Section really successful.

You will agree that it is in the interest of the profession that other men of suitable standing should be brought within our ranks to assist in furthering the aims and objects of the Institution, and particularly that we should bring in to our meetings the younger members, for whom the future of the industry depends, and it is up to us to see that they pick up the best practice we can, and that they benefit by all the Institution has to offer them. It is of interest that since our preliminary meeting in May we have received some 20 to 25 applications for membership, so that if these are confirmed we shall start with a Sub-Section membership of approximately 45, and I hope it will grow rapidly.

Sir Ernest has been very ill, and we are indeed fortunate in having him with us to-night. I will now call on Sir Ernest.

Sir Ernest Lemon rose, amid applause.

SIR ERNEST LEMON: Lord Sempill, Gentlemen. I have no written speech and I am just going to talk to you so to speak off the record. I want to thank Lord Sempill, who has been exceedingly kind to me, and who has carried on whilst I have been ill.

Now I really am here to-night I feel that I have to congratulate you first of all on having Mr. Gibbons to address you, and secondly on having Mr. Hyde-Trutch as your Chairman. I have known him a good many years, and I think that Lincoln is fortunate in having him as the Chairman of this Sub-Section.

I have been fortunate to-day in lunching with Mr. Bell and his colleagues at Robeys, and they have given me a sidelight on what Lincoln means from the engineering standpoint. One curious thing is this, that wherever you go, no engineering centre is so self-contained. Lincoln is settled amongst the farmers and the agricultural people, and here you get a high standard of skill and workmanship. I do not know whether it is draining the land of its best people and bringing them into the engineering industry, but I think it has probably something to do with it.

My main object to-night is to examine the position of Production Engineers and what they really mean in this country. Are the engineers doing what the farmer does? Are they producing two blades of grass where one grew before for, as the Americans put it, the best engineer is the man who can produce for one dollar what the other takes two dollars to produce. You have produced tools, you have increased production, and you have made it possible for the Army, the Navy and the Air Force to fight, and that is to your everlasting credit.

I am particularly concerned with what we are going to do in the future. The problem of the people coming back from the war, and the swinging over of industry to its normal channels are going to be more serious problems than building up the war potential in this country.

We have a number of Governmental interests that are planning for post-war, but as one of my former Directors once said to me, "The profits of a business are made on the floor of the workshop."

You will have in this country an enormous engineering potential, far and away more than you had before the war. It has not been built in the ordinary channels of trade because we either had to do it or we went down. You, as Production Engineers, are the people who can speak to those in authority on what can be done. We cannot afford to break this potential up. We have to regulate

it by turning over to new forms of production. We cannot tolerate the attitude of mind that says let us see about winning the war first. Are we going to sit back and say let us wait until peace comes before we can think of our future.

I know that the engineer in war-time has a heavier load than he can carry, yet he must now begin to consider the post-war position. If we start at the beginning and we say, well, what is the first thing to do? We shall have to get on the world's markets. A lot of us want to know what these markets are, what products we can sell, and how we can sell them and how we can manufacture them at such a price that we can sell at a reasonable profit. I would like to leave that thought with you. Those are the lines on which I am thinking, and about which I am worrying.

People, apart from engineers, do not really know how long it takes to build up a sales organisation, to make the tools, and whilst we may say that is the Government's job, I do think we could go back to the old characteristic of helping ourselves. We must help ourselves, and there is no use leaving it to somebody in Whitehall who doesn't know the problems. Each of us has to think what we are going to do with this war potential that has been developed.

Taking our young Production Engineers, I would like to appeal to you as your President, to bring the young men in here to have discussions, to try and train their minds on thinking on the right lines, and by the interchange of ideas with them you will find that they will learn while they talk.

We are a comparatively young Institution, but I look forward to the day when the Institution obtains a Royal Charter. Whilst we want research and academic discussions, it all boils down eventually to: can I produce these things cheaper than the other fellow? That is done by the people who guide you, and I should like you if you can to bring in younger men. The next time we come down to see you I hope we shall find that the membership has has gone up to at least 200 as a result of your efforts. If you are big and you have a big membership, and if you represent a large interest, you can make yourself felt, but if somebody says what is the membership of the Production Engineers, and you say 3,700, against the Mechanicals 15,000, well, you have got to get up somewhere near so that you can speak with an equal voice in the gateway, and the gateway after the war will lessen too.

Try, then, to bring in the younger people, and stir up their minds. I think the motto of the Production Engineers ought to be Why? Why do you do it this way, why can't we have another way? If we have done it like that for twenty years why can't we change it? Never be afraid of making mistakes. I have as you know had

a long experience, and I have changed from one job to another, and I expect I shall keep on doing so.

There is one other thing I would like to say to you, and I should like the Lincoln people to do it. It ought to be possible for the youngsters to read all the current literature on Engineering, and I would like to suggest to you that you form a really decent library. One of the books I have in mind more than anything in my work is an American book called "The twelve principles of efficiency." You can take that book and apply the principles outlined there to any job you are doing. Try and get the general principles embedded in your minds so that your natural approach to any problem is such that first of all it is scientific. In these you have many minds at work, and it is not merely your own experience. It is the experience that is recorded from all over the world. Give these youngsters a chance to have some sort of rivalry which they can enjoy and from which they can benefit. Secondly, encourage them at your meet ings to talk, and don't do what I sometimes do, gibe, when somebody does something, but treat them kindly, encourage them to talk, because after all is said and done, thoughts are only caught by words. Words are really only a sort of cage in which you catch your thoughts. I well remember the time when I c uld never get up at a public meeting without my voice going. I was thoroughly scared as a young man. It was only a question of practice and encouragement, and the older really ought to encourage the youngsters, because ideas are curious things, and on them depends what the engineering industry of this country is going to be.,

Having said that, I think that is really about all I have to say. I am very glad indeed to have had the opportunity of addressing you to-night. Gentlemen, you have a marvellous job to perform in the engineering industry of this country. All life depends to-day on what the engineer does, so be proud of your profession, make it better, and see that you make yourselves felt. Make it a virile organisation which reacts on the counsels of the country. (Applause.)

LORD SEMPILL: Mr. President, and Gentlemen. It is always a great pleasure to me to come to Lincoln, and I am fortunate enough to be associated very closely with some friends who have already been mentioned, Mr. Bell and others, in that great enterprise which he commands with such distinction. I am very proud to come here tonight and support this meeting, under the Chairmanship of my very great friend, Mr. Gibbons. He has done, as the President has told you, a very great work, and will continue to do so. It is appropriate that I should mention our Assistant Secretary, Mr. F. Gibbons, who has during the months, since the death of our former General Secretary, Mr. Richard Hazleton, carried on the very heavy and growing burden of work at headquarters, until such time as we were fortunate enough to secure Dr. Fenelon. The Institution owes

a very great and real debt to both members of the Gibbons family.

I would like to congratulate you and all concerned on the appointment of Mr. Hyde-Trutch as your new President, and to congratulate him and the others on the high offices to which they have been appointed, and you who have been responsbile for the choice, on the admirable selection that you have made.

Of course I would like to mention specially Mr. Johnstone, your Vice-President. How wise you are to have a Scot. as a Vice President! He is a powerful factor in the engineering world, and is concerned with the work of Messrs. Robeys.

We are very glad indeed that the President is back with us. He has during the war had very heavy responsibilities, and as a result had to take a period of rest, but as you have seen this evening he is pertectly fit now, and we are very heartened to have him back. Our President has a wide experience, and you have learned about some of it. He is an engineer of great renown, also an Executive who has been in control of important enterprises in this country, both on normal business lines, together with enterprises controlled by His Majesty's Ministers, such as Departments of State.

Perhaps some of you know that he played a very vital part in the realms of production engineering in those fateful years preceding the Battle of Britain. If the Battle of Britain had not been the resounding victory that it was, due to the aircraft and aircraft engines and equipment that were put in the air then, we should certainly not be meeting under these pleasant conditions here to-night. And the immense skill that Sir Ernest Lemon used when he was in this important position made it possible for sufficient equipment to be available so that the Battle of Britain was one of the most historic victories that the world has ever seen. And we are especially proud to have a President with that historic record at his back.

It was due almost entirely to the problems of production experienced in the last war that this Institution had its origin 22 years ago. It was set up as a scientific body with the object of promoting the science and practice of production engineering.

The late General Secretary once defined it as "That science which will enable us to make more and more for less and less, and will end by enabling us to make everything for nothing!" But, Gentlemen, it is in relation to manufacture that we are considering these problems to-night, and it is the science of what to my mind I might call the five M's. to which we are directing our thoughts—Men, Machines, Materials, Methods, and Management. Now if I may just talk briefly on these headings.

Men. Their education, training and proper utilisation of personnel in our engineering factories.

Machines. Machine tools, jigs, fixtures and accessories of different kinds are the chief equipment of engineering manufacture.

Material. The production engineer must keep abreast of latest developments in the use of materials, newer materials such as plastics, and other ferrous and non-ferrous alloys that are coming into use in these days.

Methods. The central core of science must always be methods of manufacture. The best method of doing a job to achieve this may mean re-designing to facilitate production, or simple changes in design may result in a great saving in man-hours and of materials.

And lastly, *Management.* You know how closely the late Lord Austin was concerned with this Institution. He was President a number of years ago, and he said that a production engineer has to be 50% an engineer and 50% a manager. There was a great truth in that broad statement, but I feel that to a greater extent than any other Engineering Institution we have to take into account such factors as scientific management, motion and time study, quality control, etc. We have a number of committees dealing with various aspects of production covering many sides of these technical problems.

The Institution, with its headquarters in London, is spreading over the world. With the new Section being formed in Melbourne, Australia, and this one now being opened at Lincoln, there are 22 sections and four graduate sections, with a total membership of over 3,700. This shows an increase of some 700 members over the past twelve months. There are now seven grades of membership, including the Affiliated grade, consisting of persons representing firms affiliated to the Institution. Eighty per cent of all subscriptions received from this Affiliated Membership Grade is handed over to our Research Department. There are two monthly publications—the *Journal* and the *Technical Bulletin*—and from time to time reports are issued by our Research Department.

Two of the most important fields of activity of the Institution are Education and Research. In the past insufficient attention has been paid to these two branches, but progress has been made. There is now a Higher National Certificate in Production Engineering, and a large number of technical colleges throughout the country are running recognised courses for this certificate. You will find some reference to the value of technological education in the White Paper that has just been laid before Parliament.

We have presented to the Govermnent a series of reports on production problems, which we believe have produced some results.

A report entitled "Increasing Production without Increasing Facilities" was presented at the time when the U.S.A. came into the war, and when the Russo-German pact was broken and Germany attacked Russia, and Russia was forced into the war on our side. It was then made clear that there must be an increase in output by the United Nations, with the possibility of there being no increase in plant facilities. This report showed two factors that had to be borne in mind, viz.: by increased machine activity and by simplification of design.

There is a certain Bren gun part, the original cost of which for materials was £4 7s. 6d. Man/machine hours for producing this 100 finished units was £234 7s. 6d. A total of £238 15s. 0d.

By the simplification of design the cost per 100 for the materials after re-design was changed from £4 7s. 6d. to £1 10s. 0d. and the man/machine hours from £234 7s. 6d. to £10 0s. exactly, a total of £11 10s. 0d. against £238 15s. 0d.

I thank you, Gentlemen, very much for allowing me to come to this meeting and to address these few remarks to you, and I wish this Sub-section every possible successs in its very important work to-day, and particularly in the post-war period when the Production Engineers will unquestionably perform a vital function.

MR. HARTLEY: Mr. Chairman, Mr. President, Lord Sempill, I want to say I count it a privilege to be asked here tonight. About 40 years ago I lived in Lincoln and worked at Rustons with Mr. Sharpley, and I still retain very happy memories of this city and of the good folks who live here. Secondly I also count it a great pleasure to be here, because I want to bring to you a message of goodwill from every member of the Council and of the Institution, and to wish you on their behalf very great success.

We at Ipswich have been studying the problems of Sub-sections in our area because we are scattered from Ipswich to Peterborough, Ipswich to, Norwich, and most of Cambridgeshire. Well, quite naturally nobody in Cambridge can come to our meetings, and we are therefore studying the problems of Sub-sections, and you have shown us how to start, and I will explain to our committee what you have done at Lincoln, and take heart and see what we can do in the eastern section.

I look upon this Institution as one of the most important that has ever been created. There is none which is doing more to help the production man than the Institution of Production Engineers. When you bear in mind the conditions of membership you will see the gateways are pretty tight, and only those qualified can have a chance of getting in.

Technical training is just as important as practical training, and I would urge you all to get the youngsters enrolled as they serve their apprenticeship, and above all else to get the technical knowledge that will make them one of the great army of production engineers. We have a great task before us but we must not lose heart.

DR. FENELON : Mr. President, My Lord, Gentlemen. It has been a great pleasure for me to come here to this splendid and most encouraging meeting. I feel a special bond of sympathy with Lincoln because you are new and so am I.

I would like to assure you that we at the head office in London, myself and Mr. F. Gibbons, will be only too anxious to do anything we can to help you, as we feel very encouraged by the formation of these sections and sub-sections.

I would like to take the opportunity of saying a word in appreciation of the Honorary Secretaries of the Institution, and it is appropriate that I should refer here to the excellent work of Mr. Shenton, who has from the beginning conducted the affairs of the Nottingham section. It is a very heavy job. I do not know whether Mr. Preston has had much experience yet, but he will find a lot to be done.

MR. HYDE-TRUTCH : So much has been said about the growth of this Sub-section in the future, that it is only right to say that in all our arrangements we are acting in close association with the Lincoln Engineering Society. We have chosen the dates of our meetings so as not to clash with theirs and it is obvious that in any activity of this kind, there is room for both Production Engineers and an Engineering Society, that deals with the technical side of engineering.

MR. VICTOR W. BONE : Mr. President, My Lord, Gentlemen. I am very gla d indeed that you have given me this opportunity because I should like to express to you as a colleague my hearty good wishes for a very successful and happy year of office. I do join with the other well-wishers in expressing the hope that you may make a splendid start, and to-night I think is evidence that you have. I can assure you that the members of the Society all agree with your Chairman that your new President is well qualified to occupy this position, and I can assure you that what he has achieved and what he is achieving in the way of improving the production line marks him out as a very fitting President of the Production Engineers.

I am glad that there is going to be close co-operation between the Production Engineers and the Lincoln Engineering Society, and that efforts will be made to avoid any clash of interest.

Mr. Hartley has made a remark that the other Institutions do not cater altogether satisfactorily for the requirements of the Production

Engineers. When we came to form the Lincoln Engineering Society just 21 years ago, we in Lincoln felt very much the same way about things, and we decided to form an Engineering Society of our own, which would be open to every class of member engaged in our engineering industry, and the local Society has endeavoured in arranging these programmes and lectures to cater for the production man, and has done it successfully. The membership is still rising and is evidence of its success.

We cannot attach too much importance to the study of production and all its problems. I have just seen some of the most important factories in Lincoln, and have been impressed by the improvement in standards in those respects to which Lord Sempill has referred, and if the formation of a Sub-section of the Institution of Production Engineers can help to raise our standard of production, not only shall we be doing a very good thing for Lincoln but for our country as well.

I wish the Chairman much happiness in his office, and the Sub-section very great success.

MR. JOHNSTONE: Mr. President, My Lord, Gentlemen. A week ago I had the opportunity of going to the Annual Meeting of the Institution in London. We have tonight an almost identical platform. It shows the virility of the Institution that here in a corner of this country we can foregather with the President, the Deputy-President, the Chairman of Council, and the General Secretary of an Institution of the size of the Institution of Production Engineers. How very few associations would bring together such a number to open a Sub-Section! I think that is proof to you, gentlemen, of the interest that is taken in this section by our Institution. Secondly, it is a great compliment to Lincoln that we should have such an assembly in this city. The Production Engineers, as Sir Ernest Lemon has said, are the salt of the earth.

Gentlemen, I have to propose this vote of thanks, but I do feel it is a privilege—and I use the word advisedly—to have heard these gentlemen this evening, and our vote of thanks and our appreciation go out to Sir Ernest Lemon, Lord Sempill, Mr. Hartley, Dr. Fenelon, and not least of all to Mr. Gibbons and Mr. Bone. I have great pleasure in joining these names and in proposing this vote of thanks.

MR. LAWSON: Mr. President, My Lord, Gentlemen. It is indeed an honour and a privilage to be asked to add to these words so ably delivered by our Vice-Chairman, Mr. Johnstone. We have had a good send-off for this newly-formed Sub-section, and we all hope that all interested will give it their support. In these days we need to get down to discussing our problems, and there must be a large number of modern methods to discuss. The Institution caters

for all sections of production and not machine shop operations only. I have great pleasure in seconding the vote of thanks, and I add my very best wishes.

The vote of thanks was carried unanimously.

MR. HYDE-TRUTCH announced the next meeting on 3rd December, "Training of Machine Tool Operators," by F. J. Keeble, Esq., of Ipswich.

The Meeting then terminated.

Research Department: Production Engineering Abstracts

(Edited by the Director of Research)

NOTE.—*The addresses of the publications referred to in these Abstracts may be obtained on application to the Research Department, Loughborough College, Loughborough*

ACCOUNTING, ADMINISTRATION.

Inauguration of a Cost System, by F. Osborn. (*The Cost Accountant, July/September, 1943, Vol. 23, No. 1, p. 6*).

Will the cost of the system justify the results? Planning : (a) Creation of information ; (b) Collection of the information ; (c) Analysis and use of the information. The process in the development of the plan consists as follows:—(1) Fixing a general goal of the cost system ; (2) Acquiring knowledge ; (3) Draft of the general goal of the system ; (4) Draft of the information required, (5) Personnel and equipment required ; (6) Application of the drafted layout. The main problems are : (1) Wages. (2) Materials. (3) Overheads.

COOLANT, LUBRICANT.

The Principles of Lubrication in Modern Deep Drawing Practice, by H. A. H. Crowther, P. D. Liddiard and K. I. Marwood. (*Sheet Metal Industries, October, 1943, Vol. 18, No. 198, p. 1733, 4 figs.*).

The necessity for adequate lubrication always has been of considerable importance : to-day it is vital. Principles of lubrication. Deep-drawing lubrication. Metals in contact. Adsorbed surfaces. Temperature. "Stick-slip." Basic lubrication requirements. Application of these principles. Type of lubrication. Scoring and fouling of punch.

ELECTRICITY.

Electronics in Modern Engineering—Parts I and II, by R. E. Blakey. (*Machinery-Lloyd, October 16th, 30th, 1943, Vol. XV, Nos. 21, 22, p. 37, 22 figs.*).

Part I.—I. Characteristics of vacuum and gaseous tubes. 1. Thermionic emission. 2. Types of filaments. Pure tungsten. Thoriated tungsten. Coated filaments. Indirectly heated cathodes. 3. Static characteristics. Characteristic curve of a diode. Schematic diagram of diode test circuit. Test set-up for determining static characteristics of a triode. Characteristic curves of average valve. 4. The valve generator. Tuned grid oscillator. II. Rectification. III. Amplification. Voltage amplification. (a) Resistance coupling. (b) Choke coupling. (c) Transformer coupling. Power amplifiers. IV. Special types of valves. Characteristic of mercury vapour rectifier. Characteristic curve of a full wave vacuum-type rectifier.

Part II.—I. Applications of thermionic devices (vacuum type). A simple rectifier system with smoothing. A temperature control system using a contact thermometer. A controller for high temperature gas, oil or electric furnaces. A sensitive indicator for inspection rooms. Measurement and control of thickness. Applications of thermionic devices (gaseous type). Speed or voltage controller. Timer for spot and projection welding. Timing

circuit for spot and projection welding. Cutler-Hammer system. An A.C. generator employing a D.C. source. Basic circuit of a parallel inverter. Self-excited inverter.

FOUNDRY.

Gravity Diecasting Practice, by G. W. Lowe. (*Brochure, 1943, 65 pp., published by Percival Marshall & Co., Ltd., Cornwallis Works, Maidenhead, Berks. 3s.*).

Applications. Design. Fundamentals. Dies. Semi-permanent mould (metal with sand core). Collapsible cores. Die manufacture in the toolroom. Casting operations in the foundry. Finishing.

(*Communicated by the British Non-Ferrous Metals Research Association*).

Gravity Diecasting. Part III. (*Aircraft Production, November, 1943, Vol. V, No. 61, p. 512, 6 figs.*).

This concluding article gives details of the final stages of the production of light-alloy gravity diecastings at a Rolls-Royce Shadow factory, and ends with a review of the characteristics of six important alloys.

The Working of Yellow Brass, by E. J. Raybould. (*Mechanical World, 22nd October, 1943, Vol. 114, No. 2964, p. 470, 7 figs.*).

A sample which has been chilled cast. The sand cast alloy. The lower rate of cooling has resulted in a coarse structure. Quenched from 600°C. and 700°C. Small grains in the thin cross-section area and larger grains found at the thicker portion. Reduced 50% at red heat. Worked at too high a temperature.

KINEMATICS.

A Brief Account of Modern Kinematics, by A. E. Richard de Jonge. (*Trans. A.S.M.E., (U.S.A.), August, 1943, Vol. 65, No. 6, p. 663, 6 figs.*).

Attempt to show what the various problems of plane kinematics are and how they have been approached and solved by simple means so as to make modern plane kinematics a usable tool, not for the mathematician or kinematician, but for the practical engineer. In this respect, the elements of a simple universally usable terminology are given, and the various branches of plane kinematics have been reviewed briefly to give the uninitiated an idea of the great simplicity of the modern methods. Quantitative kinematic synthesis has been presented briefly to the English-speaking engineer for the first time. A few remarks on the graphical methods used in space kinematics are added.

Annular Ball Bearings—II, by R. Waring-Brown. (*Power Transmission, October, 1943, Vol. 12, No. 141, p. 607, 1 fig.*).

Ball load distribution. Load and speed. Load and temperature. Gyroscopic and centrifugal effects. Load and durability. Comparison of race track design.

MACHINING, MACHINE TOOLS.

25% Speed Increase by New Drilling Technique (Rego Karweit Driller), by W. A. Phair. (*Iron Age (U.S.A.), 17th June, 1943, Vol. 151, No. 24, p. 48.*)

Increased drilling speed, improved hole finish and tolerance, and longer tool life are claimed for this new drill press attachment. The drilling of steels and alloy steels is described.

(*Communicated by the British Non-Ferrous Metals Research Association*).

The Multiple-cutter Thread Milling Process, by J. G. Smith. (*Machinery, 21st October, 1943, Vol. 63, No. 1619, p. 461, 5 figs.*).

The effective application and use of multi-cutters for thread milling in quantity production work. A variety of threads, internal or external, can be finish-cut by this means in little more than the time taken by one revolution of the work. The technique of this is discussed with the causes of slight modification of profile, or thread deformation in certain cases, with means of rectification. The factors which influence thread form are defined, and the determination by calculation of cutter and work profile produced.

On Cutting and Hobbing Gears and Worms, by D. W. Dudley and H. Poritsky. (*Journal of Applied Mechanics, (U.S.A.), September, 1943, Vol. 10, No. 3, p. A.139, 9 figs.*).

Two problems are treated, i.e. (1) given the shape of the milling cutter tooth or of the hob tooth, to find out what is the resulting shape of the worm or gear surface ; (2) given the desired shape of a worm or gear tooth, to find what shape of the milling or hobbing tooth will produce it. These problems are fundamental to all cutter and hob design. Except for special cases, the solution of these problems obtained in this treatise is believed to be new. The general equations which enable one to determine exactly the relation between the shape of the cutting tool and the shape of tooth produced are obtained in the present paper by going back to the fundamentals of the motion of a milling cutter or a hob and the motion of the worm, or gear part being cut. With these equations available it is possible to design precision tools for any worm or gear-cutting job, thus eliminating guess-work in the design, and possible delays, such a save involved in " cut-and-try " shop methods.

CHIPLESS FORMING.

Shell Forging on Bulldozers, by W. Trinks. (*Mechanical Engineering, U.S.A., September, 1943, Vol. 65, No. 9, p. 639, 9 figs.*).

A bulldozer is a forging machine, usually horizontal, in which a wide cross-head or traverse is slowly reciprocated by a pitman on each side. The machine which is recommended for shell forging, is rated to exert a force of 600,000 pounds in the last inch of the stroke. Bulldozers have been adapted to the forging of high-explosive shells by several different methods : (1) the " progressive pierce-and-draw " method, (2) the method by which the bulldozer pierces in one stroke, (3) the " French extrusion process." Various stages in progressive-piercing process. Male tools for forming 75 mm. shell blanks. Combination of piercing and cross-rolling. Principle of French extrusion process. Stages in the application of French extrusion method.

MANUFACTURING METHODS.

Marking Methods and War Production, by A. Throp. (*Engineering, 24th September, 1st October, 1943, Vol. 156, Nos. 4054, 4055, pp. 258, 278, 27 figs.*).

Marking is now a process comparable with other machine shop and fitting processes, for which planning and equipment must be provided. Classification of marking. Definition of marking and methods. Component and marking die design. Interchangeable steel type is widely used. Any combination of characters can be set up in a few seconds ; so with this equipment, solid dies can almost be avoided for numbering parts. Flat work may be numbered in rolling machines, the type for this purpose having tapered sides to facilitate assembly into roller form while keeping all letters or figures interchangeable. Illustrations : adaptors for light rings, marking stiff steel rings,

marking adjustable reamers, rotating work support, marking fuse ring, hollow-spindle fixture, cantilever fixture, automatic numbering head.

Unusual Tooling Saves Metals, Men, Materials, by J. S. Wilford. (*The Tool Engineer, U.S.A., September, 1943, Vol. XII, No. 9, p. 78, 17 figs.*).

Multiple boring bars on winch case. Broaching on a radius. Flexible drill jig. Planetary head for drill press. Small turbo coil winding machine.

Machining of Copper and Copper Alloys. (*Industry* (*Lond.*), *13th, 20th and 27th August, 1943, Vol. 63, pp. 98, 118, 137*).

Machining copper and its alloys. I. Rating machinability. Cutting tool materials. Lathe turning tools. II. Cut-off tools. Form tools. Drills. Reamers. Taps. III. Thread chasers. Milling cutters. Lubricants and coolants.

(*Communicated by the Nickel Bulletin*).

Concave Surfaces can be Milled, by Charles Havranek. (*The Machinist, 16th October, 1943, Vol. 87, No. 26, p. 97, 3 figs.*).

Apparently correct angular setting of the milling cutter for machining concave cylindrical surfaces of large radii on narrow work causes errors. These can be found and eliminated.

Hi-Cycle and Hyper Milling on Aircraft Parts, by C. H. Bodner. (*The Machinist, 2nd October, 1943, Vol. 87, No. 24, p. 103, 6 figs.*).

The Hi-cycle milling set-up is used to cut a dural forging at 10,000 surface ft. per min. with a 300 in. per min. feed. The cutter has cemented carbide teeth in a cast iron body ground to a 20 deg. positive rake with a 20-deg. positive helix angle. Double barrel air vise. Negative angles used. Such grinding requires more power to drive the machine tool than positive angles, but the results in performance justify this practice. On a typical job 60 pieces were produced in an 8 hrs. day as against 20 under previously used methods. Carbide-Meehanite cutter. The air vise.

Armor Plate Milling, by Karl B. Kaiser. (*The Machinist, 23rd October, 1943, Vol. 87, No. 27, p. 116, 6 figs.*).

Successful milling of armor plate is dependent upon satisfying the following four requirements: (1) correct cutter design, (2) correct cutter grinding, (3) correct application of cutters, and (4) correct operating conditions. Average performance records for milling armor plate. Feed rates for milling armor plate. The sheer clear cutter by the combination of negative rake, a high positive shear angle and a bevelled cutting edge. End mills of shear clear design.

The Die Casting of Screw-threaded Components, by H. K. Barton. (*Machinery, 28th October, 1943, Vol, 63, No. 1620, p. 497, 11 figs.*).

Two layouts for threaded cavities, one is not recommended. Ovality of the die casting may result either from lateral displacement of the die members or from insufficient locking pressure. Cast internal threads. Taper on thread. Two types of clipping tool. Essentials for success.

Rolling, Processing and Testing of Tinplate, by W. E. Hoare and E. S. Hedges. (*Sheet Metal Industries, October, 1943, Vol. 18, No. 198, p. 1713, 12 figs.*).

The Mellingriffith Tinning Unit consists of eight main sections—viz., the feeding section, the continuous sheet pickler, the swilling section, the double-

sweep tinning unit, the catcher rolls or manipulators, the traversing and conveyor section, the soda bath cleaners and the Aetna type clearing and polishing machines. The sheets are conveyed automatically through the entire series of operations between piling the white annealed sheets on the feed tables and removing the tinned and cleaned plates from the delivery tables at the exit end. Cross-sectional view showing general arrangement. Single sweep units. Tinning machine. Grease-pot machine. Cross-sectional diagram and plan of complete 64 in. 2-way tinning line. Principles of the tinning process. The reaction iron-tin. Cross-sectional diagram of Rogers' and Player's patent duplex tinning machine.

Design of Aluminium Hammer Forgings. (*Iron Age (U.S.A.), 17th June, 1943, Vol. 151, No. 24, p. 58*).

A general account of the design of Al alloy hammer forgings and of dies for their production. Upset forgings and press forgings will be dealt with later.

(*Communicated by the British Non-Ferrous Metals Research Association*).

Shrink Fit Tolerances—II. (*The Machinist, 16th October, 1943, Vol. 87, No. 26, p. 160E*).

Recommended interference fits for cast iron and steel bushings in aluminium at room temperature. Recommended interference fits for bronze bushings in aluminium at room temperature. Shrink fits for cast iron hub on steel shaft.

Consolidated Retools the Coronado, by E. P. Myers. (*The Machinist, 2nd October, 1943, Vol. 87, No. 24, p. 83, 10 figs.*).

A new assembly plan for giant four-engined seaplanes has the following objectives: (1) To instal all components at the earliest practical stage in assembly. Working on the structure while it is still small gives maximum accessibility and reduces the time cycle in the larger assembly fixtures. (2) To use women on every job possible. At San Diego women already comprise approximately 50% of the working force; about 90% of new employees are women. (3) To produce large tools which are structurally independent of the floor on which they rest or scaffolding which may surround them. (4) To employ so far as possible standard universal machines to replace portable electric and pneumatic tools. (5) To make assembly tools so flexible that any redesign that does not change overall ship dimensions can be met merely by re-setting the fixtures. Many illustrations show special machines, jigs, fixtures and tools.

The Horsa Glider, by Wilfred E. Goff. (*Aircraft Production, November, 1943, Vol. V, No. 61, p. 518, 40 figs.*).

Part II. Building the outer wing panels; the tail unit: pneumatic clamping for bonding the skin. The outer wing panels and the various components of the tail unit, are built by the coach-building and wood departments respectively of two large-scale car manufacturers who have each developed their own methods of production and have achieved very satisfactory results.

Light Metals and Prefabrication of Buildings, by G. Fejer. (*Light Metals, July, August, September, 1943, Vol. 6, Nos. 66, 67, 68, pp. 328, 381, 434*).

Discusses prefabricated building, with special reference to the use of Al castings, extrusions and units made from sheet. Other building materials are compared.

(*Communicated by the British Non-Ferrous Metals Research Association*).

MATERIALS, MATERIAL TESTING.

Design Strengthened Materials, by R. S. Smith and H. Gray. (*J. Aeron. Sc. (U.S.A.), Vol. 10, No. 7, July, 1943, p. 213*).

Ordinary corrugated sheet has the following disadvantages :

(1) The buckling strength is only increased for loads parallel to the corrugations. The strength perpendicular to the corrugations is reduced.
(2) The weight per unit projected area is increased.
(3) The workability of the corrugated sheet is limited.

The authors describe a new process of transferring wavy line patterns to one or both surfaces of the sheet metal by passing it through special rollers.

The object of this so-called " design strengthening " is to achieve a redistribution of metal in flat sheets so as to improve both the strength/weight and rigidity/weight ratios. The degree of improvement depends on the design of the pattern impressed and its depth.

The pattern can be applied to strengthen the sheet in one direction without weakening it in a perpendicular direction or alternatively the pattern can be such that there is an improvement in two directions at right angles. Displacement of metal can be increased to improve rigidity or decreased to meet other requirements of the finished part. The radii of the lobes in the pattern may be increased to improve transverse fatigue stress values or reduced to secure maximum flexural rigidity. Plain areas can be incorporated for riveting. Since the sheet remains substantially flat after treatment, (the distance between successive waves varying between $^1/_{32}$ and $\frac{1}{2}$ in. whilst the depth of the waves is of the order of 0.2 in.), the weight per unit projected area is the same as that of the original material and the workability as regards stamping drawing, forming or welding remains unchanged.

Data on the strength characteristic of several types of steel and aluminium sheet, both in the original flat state and after " design strengthening."

The following table shows the improvement obtained :—

Material	Tensile	Buckling (cylinder test)	Flexuralrigidity (beam test)
Stainless Steel (full hard)	Prop. Limit increased 25% Yield decreased 5%, ultimate increased 8%	Ultimate buckling strength unaffected Yield strength increased by 26% Prop. Limit increased by 35%	E.I. increased by over 80%
Alclad	Yield unaffected ultimate increased by 15%	No results given.	E.I. increased about 100%
Carbon Steel (cold rolled)	Ultimate increased by 30% Yield increased by over 250%	Buckling strength increased 70%	E.I. increased about 15%
Cr. Mo. Steel (cold rolled)	Ultimate increased by 20%	Buckling strength increased 44%	No results given.

The Strength of Cylindrical Dies, by G. Sachs and J. D. Lubahn. (*Journal of Applied Mechanics, U.S.A., September, 1943, Vol. 10, No. 3, p. A.147, 13 figs.*).

Internal-pressure tests on hot-rolled and cold-rolled steel cylinders; yield pressure-expansion curves of the same shape as those determined mathematically. The value of the flow stress can be determined by finding the theoretical pressure-expansion curve which most nearly fits the data. Values of flow stress determined in this way agree closely with the yield strength found from a tensile test. Die-steel cylinders, heat-treated to hardnesses up to 62 Rockwell C, exhibit plastic flow before failure, and the stress-strain curve permits the calculation of the flow stress by this method.

Effect of Screw Threads on Fatigue : A Review of the Literature, by S. M. Arnold. (*Mech. Eng. (U.S.A.), July, 1943, Vol. 65, No. 7, p. 497*).

Survey of knowledge of the endurance strength of screws (mainly steel) in relation to choice and treatment of material used as screw stock, design, method of manufacture and other factors. This is a section on the influence of electrodeposited Cr., Ni, Cd and Zn coatings, galvanised coatings, and anodised coatings on Al. Long bibliography.

(*Communicated by the British Non-Ferrous Metals Research Association*).

Pressed Pistons. (*Automobile Engineer, October, 1943, Vol. XXXIII, No. 441, p. 397, 8 figs.*).

Details are given of the equipment in the chemical and radiological laboratories, and the standard test practice is set out, together with a number of typical results. Finally, for purposes of comparison, technical details are given concerning German, American and Italian pressed forged pistons.

MEASURING METHODS, APPARATUS.

A Test for Measuring Drawability of Deep-Drawing Steels, by F. W. Boulger and F. B. Dahle. (*Sheet Metal Industries, October, 1943, Vol. 18, No. 198, p. 1777, 3 figs.*).

The reasons for the failure of present standard tests to evaluate the suitability of sheet metals for deep-drawing operations are discussed and an experimental testing method is proposed. This method utilises a cup-drawing procedure which integrates the properties in a steel needed to satisfy the drastic drawing operations met in service..

Optical Flats, by J. A. Haley. (*Machine Shop Magazine, October, 1943, Vol. 4, No. 10, p. 42, 6 figs.*).

Work is concave or convex. Comparing block gauges. Work is flat but dust is present. Checking a test block against a standard. The faces of the test piece are not parallel. Diagonal slope of test piece. Slope of test piece at right angles to that of flat. Measuring angular differences. Checking divergent angles.

Temperature Relations in Journal Bearing Systems, by M. Muskat and F. Morgan. (*Journal of Applied Mechanics, U.S.A., September, 1943, Vol. 10, No. 3, p. A.131, 12 figs.*).

The physical principles underlying the theoretical calculation of film and bearing temperatures have long been known, but few experimental studies have been made for the purpose of correlating the theoretical relationships. The results of such an investigation on a bearing system, operating at elevated

temperatures are given. Further research on heat conditions in bearings is urgently needed.

PHOTOGRAPHY, FILM, X-RAYS.

The Technique of X-Radiography and Notes on Gamma Ray Methods, by A. G. Peacock. (*Welding, October, 1943, Vol. XI, No. 11, p. 443, 9 figs.*).

The effects of varying the radiographic technique on the quality of the resulting radiograph. The principles of radiography. The material to be examined is interposed between the target of the X-ray tube and a photographic film and as close to the latter as possible. X-rays diverge from the focal spot in all directions and passing through the specimen register on the photographic film. The amount of blackening of the emulsion when developed is proportional to the quantity of radiation reaching it. Hence, if there is a cavity in the specimen, more radiation reaches the film, with a consequent increase in blackening on development. The technique of radiography. Principles of interpreting radiographs. Limitations and advantages of X-ray inspection. Use of gamma rays for testing welds. Equipment for gamma radiography. Technique of gamma radiography. Sensitivity. Merits and demerits of gamma rays.

X-Ray Inspection of Castings (U.S. Army Air Force's Requirements), by R. Katz. (*Met. Progress, July, 1943, Vol. 44, No. 1, p. 89*).

Details of the American system of radiographic acceptance tests for structural Al castings, including a list of definitions of terminology used for the markings appearing on radiographs.

(*Communicated by the British Non-Ferrous Metals Research Association*).

PLASTIC MATERIAL, POWDER METALLURGY.

The Processing and Application of Metal Powders, by C. S. Darling. (*Mechanical World, 1st October, 1943, Vol. 114, No. 2961, p. 375, 7 figs.*).

Most of the powders are the result of reducing metal salts by gaseous action, by reduction by electrolysis, and lately by atomisation. Tungsten powder is prepared by reduction of tungsten trioxide with hydrogen or in some instances with carbon ; powders of copper, chromium iron and nickel are produced by reduction of their oxides by gases or by electrolysis. Iron and nickel powders are obtained by a process which involves reduction of their carbonyls. In most applications the purity of the powder is above 99.0%, but with tungsten, tantalum and zirconium 99.9% is not unreasonable. Standardised compressibility of powder. Advantages and applications. Heavy alloy tips for switchgear produced by pressing and sintering to the required shape, the tips being attached by electrical brazing or silver soldering. Use of alloy powders. Determination of particle size.

Powder Metals Find Wide Use. (*The Machinist, 16th October, 1943, Vol. 87, No. 26, p. 83, 3 figs.*).

Manufacturers of powder-metal parts are now supplying structural components for aircraft, ordnance, instruments and precision tools. These parts, made from bronze, iron-copper, pure iron, even tool steels, have the advantage that they can be used with little or no machining. Physical properties of bronze, iron-copper and iron powder metals in sintered conditions.

Powder Metallurgy, by F. V. Lenel. (*Automobile Engineer, October, 1943, Vol. XXXIII, No. 441, p 415, 7 figs.*).

The physical properties of parts made from iron. The relationship between form and physical properties. The material as such, can have no specific tensile strength or ductility for example, other than that which it manifests in some particular part and shape. Even so, such qualities are directly related also to some definite sequence of operations in moulding and bricketting. Made in any other way the qualities may be different.

Powder Metallurgy : Fundamentals in Production of Moulded Parts for Engineering Purposes, by O. W. Ellis. (*Canad. Met. and Met. Ind., July, 1943, Vol. 6, No. 7, p. 26*).

A general paper on practice, advantages and limitations.

(*Communicated by the British Non-Ferrous Metals Research Association*).

Symposium on Powder Metallurgy. (*A.S.T.M., Bulletin (U.S.A.) March, 1943, p. 7*).

The spring meeting of the American Society for Testing Materials included a symposium on powder metallurgy, at which papers on the following aspects of the subjects were presented and discussed.

Powders for powder metallurgy. The effect of pressure on properties of compacts. The role of diffusion in powder metallurgy. Effect of particles size on shrinkage of powder metal compacts. Alloy powders. Metal powder friction materials. Hot pressing.

(*Communicated by the Nickel Bulletin*).

Powder Metals : A Bibliography, by N. B. McDonald. (*Library of Congress (U.S.A.), Division of Bibliography, Co-operative Bibliographies No. 2, 1943, 108 pp., Mimeographed*).

Titles, authors and references up to and including 1942 ; (No abstracts). Books, pamphlets, etc. ; general papers ; classified papers on various metals patents ; indexes of authors and patentees.

(*Communicated by the British Non-Ferrous Metals Research Association*).

SHOP ADMINISTRATION AND MANAGEMENT.

Pre-production Planning, by D. Tiranti. (*Machinery, 28th October, 1943, Vol. 63, No. 1620, p. 487, 3 figs.*).

Preliminary considerations. Pre-planning schedule. Pre-planning chart before operation. Pre-planning chart after four months operation. Progress position.

Quality Control, by John W. Parker. (*Mechanical World, 15th October, 1943, Vol. 114, No. 2963, p. 431, 1 fig.*).

The functions of inspection. Fundamentals of quality control. The study of quantitative data. Average. Standard deviation. Functions of statistical parameters.

Statistical Quality Control in Practice, by O. H. Rachwalsky. (*Machinery, 7th October, 1943, Vol, 63, No. 1617, p. 407, 3 figs.*).

Because it has been used in circumstances unsuited to statistical analysis the system has been adversely criticized. Engineers are apt to assume that a full

knowledge of the S.Q.C. method is necessary before use. This is a fallacy as it is possible to apply and benefit by S.Q.C. without any theoretical knowledge of statistics. S.Q.C. is essentially an aid to mass production and should never be attempted on a batch of less than 2,000. It is well suited to all articles made on automatic or semi-automatic machines, especially when re-tooling is not too frequent (if possible not more than once a day). (1) Quicker and more accurate inspection resulting in a saving of labour. (2) Reduction in time taken to pass the job on to the next stage of manufacture or to pass it out for shipment. (3) Reduction in scrap material because charts indicate drop in quality prior to any scrap being produced. (4) A visible record of the quality produced is always available. (5) A continuous record of the machines showing their limits of accurate working.

Centralised Tool Control at Puget Sound Navy Yard, by W. E. Ainsworth. (*The Tool Engineer* (*U.S.A.*), *September, 1943, Vol. XII, No. 9, p. 70, 7 figs.*)

By making a single department responsible for all tool distribution and maintenance, this big Navy shipyard has lengthened tool life and stepped up production. Tool and die making and repair. Tool grinding. Storage of tools. Service and maintenance. Inventory. Issuing tools. Miscellaneous duties.

How Do You Assess Merit? by R. Watson. (*Industrial Welfare, September, October, 1943, Vol. XXV, No. 290, p.131*).

Purpose of merit rating. The graphic rating report. Practical application. Common difficulties in application. Self-rating. Importance of the foreman.

Personnel Management in Relation to Factory Organisation, by L. Urwick. (*The Institute of Labour Management, Aldwych House, Aldwych, London, W.C.2, Booklet, pp. 3 to 27, Price 1/-*).

Scope of modern personnel management. Special difficulties in integrating personnel work. The importance of the correct arrangement of the duties of the personnel manager. Industrial relations—a central function. Relations between personnel units and other departments. Summary. Organisation diagram.

The Employment Exchange Service of the Ministry of Labour and National Service. (*Labour Management, August—September, 1943, Vol. XXV, No, 269, p. 79*).

Description of the functions of Employment Exchanges obtained from the Ministry of Labour and National Service. Headquarters. 11 Regional offices; 44 District Man Power offices; 31 Appointments offices.; 548 Employment Exchanges; 467 Employment offices; 209 Branch Employment offices; 248 Local Agencies. Co-operation with local organisations. Co-operation with the personnel manager.

"The Management Review," *August, 1943, Vol. XXXII, No. 8, p. 277.*

Partial list of contents:

The post-war outlook for jobs, p. 278.
Developing office supervisors, business ideas for increasing profits, p. 283.
Morals: production problem. Modern industry, p. 286.
"Victory boards" speed production. Factory management and maintenance, p. 294.
War workers and their money. Sales management, p. 298.

"The Management Review," (*U.S.A.*), *September, 1943, Vol. XXXII, No. 9, p. 321.*

Partial list of contents :

The truth about cutbacks. Factory management and maintenance, p. 322.
Time study and clerical incentives. The office economist, p. 329.
Battle-scarred veterans look to industry. Steel, p. 337.
Getting more product from less metal. Purchasing, p. 339.

SMALL TOOLS.

The Production of Form-relieved Milling Cutters, by H. G. Taylor. (*Machinery, 21st October, 1943, Vol. 63, No. 1619, p.466*).

The production of form-relieved milling cutters in very small quantities, one to four off in number, using standard tool-room equipment. Tables show the types of cutters, sizes, the method of manufacture and the actual time to be allowed for each operation. The material used is a good class high-speed steel, well annealed before machining.

Piston Turning and Diamond Tools. (*The Machinist, 30th October, 1943, Vol. 87, No. 28, p. 174E, 2 figs.*).

The Panel of the Ministry of Supply, Diamond Die and Tool Control published the first report on piston turning. Objects of the tests ; Graphs of two dull and brilliant surfaces. Forms of diamond tools used. Speed, feed and depth of cut. Conclusions.

SURFACE TREATMENT.

Chromium Plate in Engineering Applications : Its Thickness and Finishing, by T. G. Coyle. (*A.S.T.M.* (*U.S.A.*), *Preprint 29, June-July, 1943, 6 pp.*).

Information on suitable plating thicknesses and finishes for dies, machine tools, gauges, etc., which are intended to serve only as a guide and not as hard and fast recommendations ; each individual case requires to have its optimum thickness determined by trial.

(*Communicated by the British Non-Ferrous Metals Research Association*).

Electrodeposition of Chromium. (*Production and Engineering Bulletin, October, 1943, Vol. 2, No. 11, p. 483, 13 figs.*).

Direct application of deposits of chromium gives hard wear-resisting surfaces and enables economies to be effected in the use of high-grade alloys. End faces of gauges. Plug gauges. Roller dies and reamers. Cartridge punches, surface-hardened and built up by chrome deposition. Special cast iron tube drawing dies built up with electrodeposited chromium. Spindles. Nut and socket. Pinion shafts, undersize on diameter, have been reclaimed by chrome deposition. The undersize on the journal diameters of a camshaft was reclaimed by building-up the bearings with a deposit of chromium. Milling cutters, oversize in the bore, reclaimed by chrome deposition.

Cylinder and Ring Life with Porous Chromium-Plated Rings, by Tracy C. Jarrett. (*Mechanical Engineering, U.S.A., September, 1943, Vol. 65, No. 9, p. 633, 9 figs.*).

The decorative type of chromium plate is usually about 0.00002 to 0.00005 in. in thickness and, in most instances, is applied over other electro-

plates such as copper or nickel. The chromium-plated surfaces to resist wear have a thickness of from 0.005 to 0.030 in., applied directly to the base material.

The plating of tools to resist wear is usually done at a much higher current density than the decorative type, to obtain a hard plate. Recently a new chromium plate has been developed which has a porous surface which is applied after the hard chromium has been electrodeposited. This porous condition usually extends about 0.001 to 0.0015 in. in depth, leaving the rest of the plate as it was originally. The porous-chromium-plated ring has advantages over the usual hard chromium plate. The porous surface permits e.g., the piston ring to carry oil for immediate seating purposes, and at the same time permits it to wear quickly and produce its own mating surface for its particular barrel. While the data included pertain to aircraft engines, a similar relationship applies to the cylinder and ring life of Diesel engines. Cross sections of hard-chromium-plated and of porous-chromium-plated cast-iron piston rings. Table 1. Cylinder wear of engines run with plain cast-iron ring operating under abnormal dust conditions. Table 2. Cylinder wear of engines run with porous-chromium-plated rings operating under abnormal dust conditions. Table 3. Ring wear of porous-chromium-plated rings operating under abnormal dust conditions.

Blackening Steel Parts : A Follow-through of the Process, by A. P. Hill. (*Met. Finishing, July, 1943, Vol. 41, No. 7, p. 428*).

A short account of the chemical blackening process used instead of plating.

(*Communicated by the British Non-Ferrous Metals Research Association*).

Blackening of Non-Ferrous Metals, by W. R. Meyer. (*Amer. Electroplaters' Soc., 31st Annual Convention Paper, June, 1943, Long Abstract in Iron Age, 22nd July, 1943, Vol. 152, No. 4, p. 55*).

Describes chemical methods for the production of black coatings, and the production of coatings which are subsequently blackened. Metals dealt with are Ni, Cd, stainless steels, Al, Zn, Cu and brass.

(*Communicated by the British Non-Ferrous Metals Research Association*).

Inspection of Cleaning Methods for Light Alloy Sheets, by W. S. Simmie, (*Welding, October, 1943, Vol. XI, No. 11, p. 462, 2 figs.*).

The inspection methods used for light alloy sheets prior to spot welding. A new apparatus is described which as been developed at the works of the Pressed Steel Company, Ltd. Description of apparatus. Testing of pickled sheet. Applications.

Polishing Processes, by H. Silman. (*Sheet Metal Industries, October, 1943, Vol. 18, No. 198, p. 1759, 3 figs.*).

The art of polishing. Aluminium. Stainless steel. Zinc base die-castings. Nickel-plate. Chromium-plate. Dust extraction. Barrel polishing. Scouring. Final polishing (barrel burnishing). Electrolytic polishing. Electrolytic brightening of aluminium.

TECHNICAL EDUCATION.

Training Foremen, by F. J. Burns Morton. (*Industrial Welfare, September, October, 1943, Vol. XXV, No. 290, p. 134*).

The centralised labour office. The foreman's position. Planning development. Initiating training schemes. Conference-training. Status. Advantages of training foremen.

Training Employees for the War and After, by R. O. Johnson. (*Mechanical Engineering, U.S.A., September, 1943, Vol. 65, No. 9, p. 661, 1 fig.*).

Preliminary training for assignment. Training as a basic function of supervision. Development of training programmes prior to the war. Effect of war on training. To-day, our efforts are devoted principally to three categories of training. (1) employee or job training; (2) short-term courses for the development of new supervisors; and (3) foremen conferences. On two factors rests largely the success of job training, i.e., (1) proper selection and training of the instructor, and (2) determination of just what training is to be given and in what order. Training of prospective supervisors. Training for needs beyond the war.

WELDING.

Arc Welding Faults and Corrections—III, IV, by C. H. Jennings. (*The Machinist, Reference Book Sheet, 9th October, 1943, Vol. 87, No. 25, p. 121, 9 figs.*).

Cracked welds. Poor surface. Good surface. Irregular quality. Uniform quality. Residual stresses. Corrosion. Spatter. Warping of thin plates.

Accident Prevention, Working Conditions and Welfare Work in Factories. (*Mechanical World, 22nd October, 1943, Vol. 114, No. 2964, p. 482*).

Annual report of the chief inspector of factories for the year 1942. Reportable accidents (fatal and non-fatal). Reportable accidents to women in certain industries. Details of the reports. Heating and ventilation. Lighting. Personnel management and welfare supervision. Industrial health. Hours of employment. Canteens.

WELFARE, SAFETY, ACCIDENTS.

Notes on the Introduction of a Factory Medical Service. (*Labour Management August—September, 1943, Vol. XXV, No. 269, p. 74*).

The engagement of medical officers. Expenditure without financial return. 1. Treatment of minor and major injuries. 2. Examination of new entrants. 3. Medical survey of the works environment with a view to its continuous improvement. Sickness absence. The medical officer should work hand-in-glove with the other members of the management.

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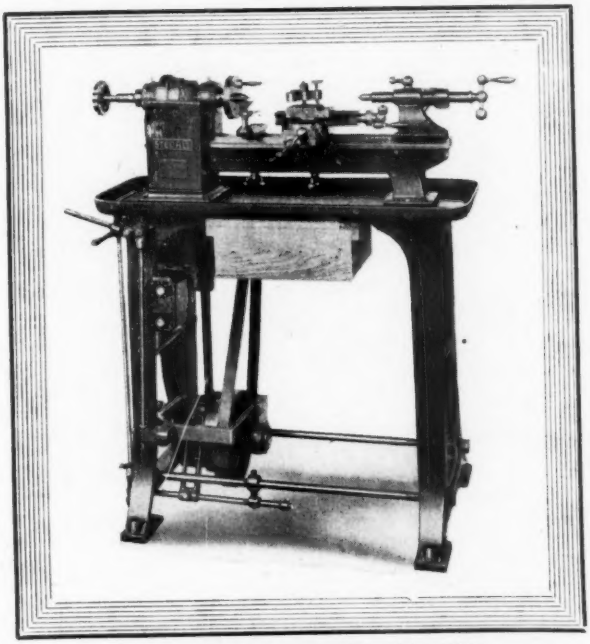

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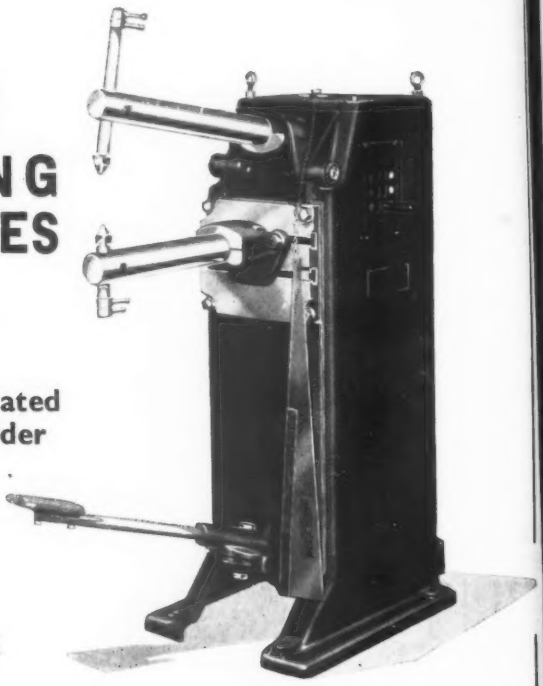

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